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This Week

At the Packard plant a great job of synchronizing the operations through the different departments for both models has been done. Joseph Geschelin tells the story of just how it is done and there are plenty of pictures. Practically every operation on the 88 acres of model efficiency is described and illustrated. It begins on page 628.

Plymouth has some interesting features in the manufacture of pistons that are described on page 639.

R. W. Young of the Wright Aeronautical Corp. has described a new automatic mixture control. The article will be found on page 642.

Deliveries in High Gear With Future Orders Strong

April Retail Car Sales 400,000, Trucks 60,000; Used Car Stocks Still Climb as Hopes Turn to Bonus

This motor business is still going strong, unmindful of the drooping security markets. Latest reports on retail deliveries showed that the figures had climbed into new high ground for the year and there is no abatement as yet in the strong retail demand. Officials returning from field trips are in an optimistic frame of mind and some are revising upward their May production schedules. They have the hunch that the current month will bring a bigger volume of business than even their revised forecasts indicate.

A few of the leading companies operating at capacity already have their entire May output sold and are taking orders that will not be filled until June. In one instance, 75 per cent of the June Quota already is taken. Factories are receiving urgent calls from dealers for more cars. The field shortage that developed with the sudden upturn in demand during March has not been overcome, despite the fact that in the neighborhood of a half-million cars were turned out last month. A similar output is indicated by May schedules.

Dealers reduced their stocks of pas-

(*Turn to page 620, please*)

Diesel Record to Eyston

Captain George Eyston, ace British driver, established what was said to be the first official world speed record for Diesel-powered cars, when he drove his Ricardo 12-cylinder Diesel over Bonneville Salt Beds, Utah, at a speed of 158.87 m.p.h., April 30.

Eyston made three attacks on the

(*Turn to page 620, please*)

Union Probation Ended

"Progressive" Faction Takes Charge of South Bend Workers' Convention as A. F. of L. Ends Control

"I am here to end now the administration of your affairs by men appointed by the American Federation of Labor, to terminate the probationary period and to place the destinies of this great organization in your hands."

With this pronouncement William Green, president of the American Federation of Labor, placed the United Automobile Workers International Union on its own on the first day of its convention here this week. Thus, precisely eight months after the chartering of the union, was the troublesome issue disposed of before deliberations of the delegates got under way.

Applause and cheers greeted the announcement which came at the close of an hour-long address by Mr. Green. Until then, no one knew whether Green or his appointee, F. J. Dillon, provisional president of the U.A.W., would attempt to control the early sessions of the convention. While autonomy for the new union had been decided upon by the A. F. of L. for the latter part of April, the exact date for relinquishing control had not been announced.

Contributing further to harmony was Dillon's announcement, in the course of his address opening the convention, that "under no circumstances would I consent to be a candidate for any office within the gift of the United Automobile Workers of America." Dillon's prompt withdrawal from the picture left the convention in the hands of the Martin-Hall faction which clearly was in the majority. Homer Martin, gen-

(*Turn to page 624, please*)

"I am here to end now the administration of your affairs by men appointed by the A. F. of L."—William Green addressed the U. A. W. convention in South Bend. F. J. Dillon, provisional president of the U. A. W., sits behind Mr. Green

New Records for the Leaders

GM First Quarter Earnings Are Largest Since 1929, While Chrysler Tops All but Last of '35

Net profit of the General Motors Corp. for the three months ending March 31, 1936, totaled $52,464,174 and was the highest for the quarter since 1929. During the same period last year, earnings amounted to $31,510,371. Earnings per common share this year amounted to $1.17 compared with 68 cents in 1935.

Net sales for the first quarter, excluding inter-divisional transactions amounted to $341,306,065 compared with $251,674,903 the year before.

General Motors' world sales to dealers, representing a gain of 28.7 per cent, totaled 500,167 cars and trucks, compared with 388,716 units in the first quarter of 1935. Sales to dealers in the United States increased 36.2 per cent and totaled 410,314 units while sales by U. S. dealers to consumers amounted to 379,950 units and represented a gain of 47.2 per cent over the same period a year ago.

The Chrysler Corp. has reported net profit for the first quarter of $11,453,439, the largest for any quarter in the corporation's history with the exception of the fourth quarter of 1935. This compares with a net profit for the same period last year of $9,163,182 after deducting a non-recurring charge of $1,507,525 representing premium on the Dodge Brothers debentures, called May 1, 1935.

At the same time announcement was made of the largest dividend distribution ever made by the corporation—$1.50 a share payable June 30 to holders of record June 1.

Increased profit was effected in spite of a slight decrease in sales which totaled 239,867 cars and trucks compared with 247,631 during the same period last year. Total sales amounted to $148,463,175 against $149,949,990 for the first quarter of 1935.

Upsetting its earnings statement almost dollar-for-dollar, the Packard Motor Car Co. has reported net profits for the first quarter of $1,248,029, compared with a net loss for the same period in 1935 of $1,210,162.

Factory shipments for the period totaled 16,282 cars and represented a gain of more than 400 per cent over the 3839 units turned out during the first three months of 1935. Cash and marketable securities on hand March 31 had increased from $6,261,596 in 1935 to $12,628,280 in 1936.

Net earnings of the Studebaker Corp. for the first quarter totaled $104,655. Since the newly organized company did not begin operation until March 9, 1935, no comparison is available with last year.

Net sales for the quarter totaled $15,738,737, compared with $33,837,892 for the entire period from March 9 to Dec. 31, 1935. Studebaker production for the quarter was reported 50 per cent ahead of the same period last year and retail sales by dealers in the United States were 56 per cent ahead of the 1935 total.

Yellow Truck & Coach Mfg. Co. has reported net earnings for the first quarter of $791,042, compared with a net loss of $239,968 for the same period in 1935. This is the largest first quarter earnings for the company in at least eight years.

"Power Alcohol" on Program Of Farm-Science Conference

The second Dearborn conference of agriculture, industry and science will be held at Dearborn, Mich., May 12 to 14 inclusive. The purpose of this conference is to survey the variety of farm products through applied science, into raw materials usable to industry.

An attempt will be made at the conference to define the scientific research problems essential to its realization; to stimulate appropriate research in public and private institutions; to activate American industry to apply the fruits of research and to encourage the joint cooperation of agriculture, industry and science in promoting its development nationally.

The conference hopes that such cooperation will result in the absorption of much of the domestic farm surplus by industry, increase the purchasing power of farmers and revive American industry.

The session of Wednesday, May 13, will be devoted to the subject of "Power Alcohol." Papers to be read at this session are: "The Relation of Power Alcohol to Our Economic Problems," by Francis P. Garvan, president of the Chemical Foundation; "America's First Power Alcohol Plant" (illustrated with motion pictures), by W. W. Buffum, treasurer and general manager of the Chemical Foundation; "Jerusalem Artichokes," by Dr. W. L. Burlison, head of department of agronomy, University of Illinois; "Coming Motor Fuels," by Floyd F. Kishline, chief engineer, Graham-Paige Motors Corp.; and "Our Domestic Petroleum Supply," by Dr. Benjamin T. Brooks, chemical engineer, New York. The papers will be discussed by William R. Boyd, vice-president of the American Petroleum Institute.

Tractor Employment Rose 36.1% During Last Year

Employment in factories engaged in tractor manufacture on Jan. 1 of this year stood at the index of 117.3 per cent over the 1923-25 average. A total of 91,760 workers were employed, an increase of 36.1 per cent over Jan. 1, 1935. Payrolls for January were $2,282,945.

A large part of last year's increase is attributed to increased export business, with 10,976 units sold in foreign countries. American sales last year were 134,379 units.

Concerns engaged in tractor building report that all indexes for last year have been surpassed this year.

Reopening of Pontiac Foundry Adds 650 Workers to Payrolls

Pontiac Motor Co.'s foundry, which opened early this year after being idle since 1932, is working at approximately 75 per cent capacity. Two of its four cupolas are melting and pouring some 200 tons of iron daily with one shift. When in full operation, from 350 to 400 tons a day will be the normal production. Its $500,000 reconstruction program, started last summer, is nearing completion.

Reopening of the foundry added 650 workers to Pontiac's payrolls and when the reequipment program is finished from 300 to 400 more will be needed.

Safety Glass Standards

A.S.A. Adopts Specifications to Measure Qualities: Special Tests for Windshield Glass

Specifications for safety glass and tests to determine the qualities of this material have been adopted by the American Standards Association. To assure that the glass has adequate resistance to impact, a half-pound steel ball is dropped onto a sample from a height of 10 ft. and an 11-lb. bag of lead shot is dropped onto it from a height of 8 ft.

Glass intended for windshields is subjected to even more severe impact tests, which it must withstand without fracturing. If a sufficient impact is dealt the glass so that it is broken, none of the fragments formed must be over 0.15 ounce in weight. To test the resistance of the glass to a sharp blow by a small, hard object, a specially shaped steel dart is dropped from a height of 10 ft. This may crack or puncture the sample, but the glass must be of such nature that no loose or detached pieces leave the plate, except at the point of puncture.

Provisions are made in the standards to provide against discoloration. Samples of the glass are subjected to ultraviolet radiation with a cumulative effect equal to that of normal use for

2½ years. Only a very slight color change, noticeable when the glass is placed against a white background, will be permitted.

To determine the ability of the glass to withstand separating tendencies, the sample is immersed for two weeks in a saturated solution of sodium nitrate. No separation is permissible, beyond an occasional spot extending not more than a quarter of an inch from the edge.

To determine the effect of tropical temperatures on the glass over an extended period, the samples are immersed in boiling water for two hours. If bubbles or other serious defects result, the samples are rejected. Tests with optical instruments are required to insure against distortion.

Automotive Labor Leaders

First group.—Among the visitors from various independent unions at South Bend this week were: (left to right) Richard R. Frankensteen, president of the Automotive Industrial Workers Association; Miss Rose Pesotta, vice-president of the International Ladies' Garment Workers Union; and A. E. Greer, president of the Associated Automobile Workers of America.

Second group.—Leaders of the progressive faction of the international union, the United Automobile Workers of America: (left to right) Homer W. Martin, Kansas City, vice-president and candidate for the presidency; George F. Addes, Toledo, financial secretary of the Toledo local and candidate for general secretary-treasurer; Wyndham Mortimer, Cleveland, candidate for vice-president; and Edward Hall, Milwaukee, secretary-treasurer of the international union.

Third group.—Russell J. Merrill (second from left), South Bend candidate for vice-president of the international union, was greeted by friends as he arrived at the meeting; L. R. Towner, vice-president of Studebaker local No. 5 is at the left; Forrest G. Woods, member of the general executive board of the international union, stands behind Mr. Merrill and Adolph Fritz, Indianapolis, secretary of the Indiana Federation of Labor.

Bottom group.—F. J. Dillon and his party as they entered the convention hall. Left to right: Samuel Isard, special organizer of the A. F. of L.; Miss Katherine Sandretto, secretary to Mr. Dillon; Mr. Dillon; Roderick MacDonald, special organizer for the international union; and Philips Garman, director of the A. F. of L. research bureau in charge of automobile statistics. All are from Detroit.

Deliveries in High Gear

(*Continued from page 617*)

senger cars in March by 20,000 units, going into April with roughly 400,000 units on hand or about a month's supply on the basis of the past month's delivery rate.

It is estimated that April will show retail deliveries in the domestic market of around 400,000 passenger cars and close to 60,000 trucks, a total of nearly 460,000 units or about 19 per cent more than were delivered in April last year, when in addition to the seasonal bulge, the retail market was still enjoying the stimulus of new models. With autumn introductions, that stimulus has pretty well worn off by now, leaving in the main only the seasonal impetus to account for the current high rate of activity. The above estimate for April deliveries compares with 399,000 units delivered in March and 386,000 in April last year.

While dealers are having difficulty supplying the right model at the right time in their new car department, they are not faced with that difficulty in the used car end of their business. Since the spring rise got under way, used car stocks have been gradually climbing and are expected to continue on the up-grade for a few weeks. They went up some eight per cent in March. No estimate is available as yet for April although it is known that the upward trend has not been broken. Besides the normally heavier movement in good weather, dealers are counting on the veterans' bonus money to be an important factor in liquidating used car inventories this summer.

Total factory sales of Studebaker cars and trucks totaled 5906 for the first 20 days of April, topping the previous year's total for the period by 51 per cent. The 4655 retail deliveries by dealers in the United States for the same period represented a gain of 63 per cent over the 1935 figure.

Production of 1936 Oldsmoble models to date totals 127,030 units and surpasses the entire production of 1935 models, 126,769 cars, which was the previous all-time high.

Pontiac retail sales in the second ten days of April totaled 6309 cars compared with 5434 in the first ten days of the month and 5848 in the second ten days of April, 1935.

May production schedules at Buick have been set for 18,043 units, exclusive of Canadian shipments. Operations are on a five-day basis with two and three shifts throughout the plant. Approximately 12,500 unfilled orders are on hand. Production for second ten days of April totaled 5842 units compared with 5568 in the first ten days and 2552 in the same period a year ago.

The meeting of the Chicago division, S. A. E., on next Tuesday, May 5, will comprise an inspection trip to the Municipal Airport. The dinner and meeting will be held in the club rooms of the Clearing Industrial Club.

Earnings Statements of Automotive Companies

	1st Quarter 1936	1st Quarter 1935
Chrysler Corp.	$11,453,439	$9,163,182
General Motors Corp.	52,464,174	31,510,371
Studebaker Corp.	104,654	.....
Packard Motor Car Co.	1,248,029	1,210,162*
Yellow Truck and Coach Co.	791,042	239,968*
Allis-Chalmers Mfg. Co.	754,127	22,242*
Bendix Aviation Corp.	860,820	803,537
Borg-Warner Corp.	1,575,363	1,383,846
Briggs & Stratton Corp.	321,850	375,075
Electric Auto Lite Co.	852,515	693,675
Evans Products Co.	255,917	250,292
Federal Screw Works	9,499*	16,760†
Link-Belt Co.	307,133	200,978
Noblitt-Sparks Industries, Inc.	107,900	108,630
Stewart-Warner Corp.	432,000	496,063

* Net loss. † Before taxes.

Hoffman Not Offered AAA Job, Henry Says

Press reports to the effect that Governor Harold Hoffman of New Jersey has been tendered the post of executive vice-president of the American Automobile Association were flatly denied in Washington this week.

Thomas P. Henry of Detroit, president of the national motoring body, said that no approach in regard to that position had been made to Governor Hoffman or anyone else, and that no step is being taken toward the filling of the position.

"Russell E. Singer has been general manager for several years," Mr. Henry added, "and continues in that position in charge of our national headquarters, subject to the direction of the president and the executive committee."

Diesel Record to Eyston

(*Continued from page 617*)

measured mile. His first trial established a record of 155.36 m.p.h.; his second attempt was better, 158.87 m.p.h.; and the third, an attempt to boost his speed by using larger wheels, netted a mark of 153.74 m.p.h. Poor visibility was said to have caused the slower speed on the third trial.

Eyston drove the same straightaway course over which Sir Malcolm Campbell, last September, established a new world land speed record of 301.1292 m.p.h.

Albert Pauli

Albert Pauli, credit manager of S.K.F. Industries, Inc., died on Sunday, April 26, following an operation in Brooklyn, N. Y. Mr. Pauli had been with the company for more than 20 years.

Lord Invernairn

Lord Invernairn, one of the great British industrialists of the past generation, died at Flichily, Inverness-shire, Scotland, on April 10, at the age of 79. As William Beardmore, he developed the Parkhead Forge, taken over from his father, until it became one of the greatest armament centers in Great Britain. He was also responsible for the airship works at Inchinnan, where the R-34, which made the first airship voyage across the Atlantic, was built.

Beardmore was responsible also for much progress in the field of internal-combustion engineering. In 1907 he carried out extensive experiments with gas engines on the gunboat Rattler and afterward developed a semi-Diesel engine. Later he arranged for the manufacture of the Franco-Tosi (Italian) engine in Great Britain.

The number of firms established or taken over by him was quite large, and during the war these firms turned out ships, airplanes, guns, engines, motor cars, shells, fuses and armor plate, the latter to the amount of 1,100,000 tons. Beardmore retired from active connection with the business about 10 years ago; he was created a baronet in 1914 and raised to the peerage as Lord Invernairn of Strathnarin in 1921.

AMA Gets Recognition

Cited for Stabilization as Tool Makers Get Executives' Award

At the annual dinner of the American Trade Association Executives in Washington on Tuesday, April 28, the Automobile Manufacturers Association was awarded a Certificate of Honorable Recognition for its achievement in the stabilization of employment in the motor industry. The certificate, presented by Daniel C. Roper, Secretary of Commerce, to Alfred Reeves, vice-president and general manager of the A. M. A., was in connection with the annual executives' award to trade associations for outstanding work in their respective industries.

The first award went to the National Machine Tool Builders Association and was presented to Herman H. Lind, general manager. The award was based on the achievements of the association to develop new markets for machine tools, particularly in the automotive and refrigeration industries, and for its sponsorship of the highly success-

ful industrial exhibition in Cleveland last October.

In addition to its achievements in the stabilization of employment, the A. M. A. was cited for many specific achievements including the bringing about of a new all-time employment record for the last quarter of 1935, an increase in payrolls from $3,700,000 in 1932 to $13,741,000 in 1935, and an average annual increase in earnings of 30 per cent.

A Certificate of Recognition was awarded, among others, to the American Trucking Association.

At a meeting the preceding day, Stephen M. duBrul of the General Motors Corp., under the title, "Fugitives from Information," discussed the statistical activities of trade associations with particular mention of their relations with the Federal Trade Commission.

GM Officials to Visit West Coast Operations

Alfred P. Sloan, Jr., president, and several other General Motor officials will visit the Pacific Coast late this month to dedicate the new $2,500,000 plant of the newly organized Southern California Division of General Motors Corp. and inspect other properties of the corporation in California, Oregon and Washington, it was announced this week.

The new plant will be dedicated at Los Angeles May 23. Other properties to be inspected include the Chevrolet warehouse at Los Angeles, the Chevrolet assembly plant, the Fisher Body plant and the General Motors Parts Corp. warehouse in Oakland; the Fisher woodworking plant at Seattle and the Chevrolet warehouse at Portland.

Other General Motors officials who will be in the party, which expects to spend a week on the West Coast, include: W. S. Knudsen, executive vice-president; J. L. Pratt, vice-president; R. H. Grant, vice-president in charge of sales; James D. Mooney, vice-president in charge of overseas operations; John J. Schumann, Jr., president of General Motors Acceptance Corp., and Paul W. Garrett, director of public relations.

Mack Model EH Streamlined

New Model, Listed at $2250, Features Modern Styling and All-Metal Roof, Integral With Cab

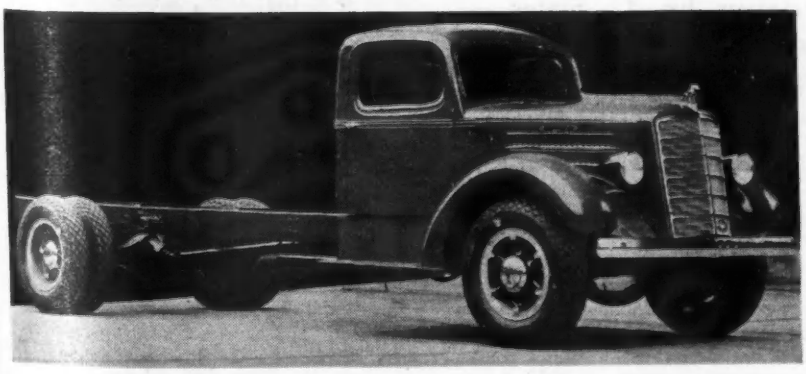
A new model EH, just announced by Mack Trucks, Inc., rates at 18,000 lb. gross and lists at $2250 f.o.b. Allentown, Pa. It is featured by up-to-date styling, having creased fenders, catwalks between hood and fenders, a chromium-plated radiator grille and a streamlined cab with sloping windshield. Hood louvers are of a new design and the angle of these louvers is repeated in the sloping radiator grille and the windshield.

The all-metal roof is integral with the cab. Safety glass all around is standard. Interior cab fittings include a dome light, coat hooks and an indirectly lighted instrument board with clock-type instruments.

Model EH is offered in standard wheelbase lengths of 146 and 158 in. for the truck and 139 in. for the tractor chassis. It can be furnished in other lengths at extra cost. About 30 per cent of the gross weight is carried on the front wheels, this weight distribution having been achieved by setting the front axle back, the distance from the front axle to the rear of the cab being only 74 in.

The new chassis carries the Mack Model BG engine, a six-cylinder type of 3⅝-in. bore by 5-in. stroke, which develops 79 hp. at its governed speed of 2300 r.p.m. Drive is from the dry, single-plate clutch through a five-speed, unit-with-engine transmission with direct drive in fifth speed. A transmission with an overdrive fifth is available at extra cost. The rear axle is of the single-reduction spiral-bevel-gear type, but a double-reduction axle is available at extra cost. Both axles are of the full-floating type and employ the Hotchkiss drive. There are three needle-bearing universal joints in the drive shaft, which is supported by a self-aligning center bearing. Six ratios are available when the single-reduction axle is used, ranging from 4.40 to 7.40; with the double-reduction axle two reduction ratios are offered, of 7.35 and 8.21 respectively.

Hydraulic four-wheel brakes are fitted and are actuated by vacuum booster. The total frictional area of the foot brake is 370 sq. in. Side rails of the chassis frame have an 8½ by 3¼ by ¼-in. maximum section. There are three box girder-type cross members and these have an alligator-jaw attachment to the side rails. In addition there are two channel-type cross members. Mack rubber shock insulators are a feature of the chassis suspension. The front axle is of the I-section type, with reversed Elliott axle ends, and the steering gear has a ratio of 18:1.



Mack Model EH truck chassis

Huge "Average Driver" Test Begun by Standard of Ind.

Heralded as the "World's Greatest Road Test," Standard Oil of Indiana launched this week a 65-day driving test in which they expect 300,000 motorists within the 15 States served by the company to participate.

The purpose of the test is to "learn the truth about gasoline mileage" as actually experienced by the driving public under normal conditions. While record books and identification emblems have been stocked at all Standard outlets, it is made clear than any brand of gasoline or oil may be used in the test.

To insure the return of a large number of complete records, cash prizes and a large list of articles of merchandise will be awarded based on the completeness of the records and the best answer to a stated question.

Metalcraft-Jacobs Merger

Stockholders of the Grand Rapids Metalcraft Corp. have approved merger with the F. L. Jacobs Co., Detroit, on a basis of exchange of five shares of Metalcraft common stock for one of Jacobs common. The new company will be known as the F. L. Jacobs Co. and the Grand Rapids plant will become the Metalcraft division with Wallace Hook, president of Metalcraft, directing the division as vice-president and a director of the new concern.

J. G. Brill Co. Promotions

Charles O. Guernsey, of the J. G. Brill Co., Philadelphia, has been promoted vice-president in charge of engineering, sales and service of his company. He was formerly vice-president in charge of engineering alone. Other promotions announced by the J. G. Brill Co. are those of L. M. De Turk, who is now in charge of mechanical engineering, and K. L. Dietrich, in charge of structural engineering.

Tire Markets Healthy

Stocks Are 12% Below Last Year; Replacement Sales Expected to Jump After Poor First Quarter

Total pneumatic tire stocks in the hands of manufacturers, independent dealers, petroleum companies, chain stores and mail order houses on April 1 were fully 12 per cent less than on the same date a year ago, according to data compiled by the rubber industry, based upon its own inventory figures and the April 1 Department of Commerce semi-annual census of tire distributor stocks in the United States. In view of the fact that renewal tire sales in the first quarter of 1936 were substantially under those for the same period of 1935 due to the severity of the weather, and that the tire market is just now opening seasonally, the industry's inventory position is extremely favorable and should augur for stabilized production for at least another half year.

While tire stocks per independent dealer averaged 71.9 casings each, or 3.7 tires more than a year ago, due to the shrinkage in the number of independent dealers during the past year, total independent dealer stocks as of April 1 are estimated to have been approximately 3,595,000, compared with more than 3,700,000 a year ago. Stocks in the hands of manufacturer-owned stores, mail-order houses, chains, oil companies, etc., on April 1 of this year were approximately 2,970,980, compared with 3,709,000 a year ago. While manufacturers' inventories had been running heavy in the first two months of 1936, these inventories were sharply reduced due to the six weeks' Goodyear strike in Akron, so that manufacturers' inventories April 1 were only about 10,000,000, against 11,400,000 on April 1, 1935.

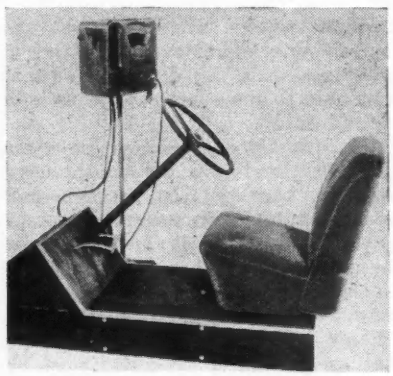
Total stocks were approximately 16,640,000 casings April 1 of this year, compared with 18,809,000 casings on April 1, 1935. While original equipment sales to car manufacturers have been running heavier than last year, replacement tire sales in the first quarter of 1936 did not reach 5,000,000 units, as compared with more than 5,500,000 in the first quarter of 1935. In the second quarter last year retail sales were 7,700,000.

The industry expects total replacement sales for the year to exceed 29,500,000 and possibly to reach 30,000,000. These sales last year were slightly under 29,300,000. Total original equipment sales for 1936 should exceed the figure of 19,100,000 for 1935.

The Department of Commerce survey figures show independent dealer stocks averaging 71.9 tires per dealer, compared with 68.2 a year ago, and it is estimated that there are today only 50,000 independents against 55,000 a year ago. Dealer stocks on April 1, 1934, averaged 79.7 tires per outlet.

The 20 larger oil company distributors reporting to the Department of Commerce showed total stocks of 1,000,406 tires this April, compared with 1,593,000 a year ago. The number of their outlets this April was 46,371, as against 49,104 a year ago. Stocks in the hands of 1768 manufacturer-owned retail stores and 1339 retail stores of chains and mail order houses were 1,626,572 this April, against 1,730,000 a year ago.

The Government figures show that of independent dealers reporting, 32.4 per cent sell automobiles, 75.9 per cent sell gasoline and 72.1 handle batteries, with 11.38 per cent equipped to vulcanize and retread passenger car tires and 5.3 per cent equipped to vulcanize truck and bus tires.



This driver reaction meter, newest achievement of Bendix Products Corp., is complete with steering-wheel seat and pedals. Reaction time in tenths of seconds is recorded on both dial and card.

Highway Planning Surveys Undertaken by 32 States

Comprehensive highway planning surveys conducted by state highway departments, with the advice and guidance of the United States Bureau of Public Roads, are under way or about to be undertaken in 32 states. It is believed that the completed studies will point the way for the development of long-term highway programs and tax reduction.

These projects will include an inventory of every mile of passable road in each state, a study of the character and extent of traffic on the various roads, and a careful examination of highway costs, expenditures, and revenues. The factors of capital cost, road life, and maintenance cost also will be considered.

It is expected that the survey will cover a full year. Analysis of the records, maps, and other data accumulated is expected to take another year. The results of the survey and the analyses made will be developed into a report which carefully evaluates and outlines the complete highway picture. This program will substitute an acceptance of a perpetual and continuing obligation of maintenance and rebuilding when necessary for the present casual treatment of roads, year by year, with annual demands and appropriations.

German Automotive Exports Reached New High in 1935

German exports of motor vehicles during 1935 reached record levels, a report to the Department of Commerce from its Berlin office shows. Shipments abroad of passenger cars from Germany in 1935 totaled 19,631 units, compared with 10,994 units in 1934 and 4809 units in 1929. Truck exports totaled 3765 units, compared with 2242 in 1934 and 2975 in 1929. Motorcycle exports totaled 5702 units, compared with 1804 in 1934 and 7540 in 1929, statistics show.

While German motor vehicle exports in 1935 were consigned mainly to European countries, there was a notable expansion in shipments to oversea markets. Spain, Belgium, Switzerland, Sweden and the Netherlands were the outstanding individual markets for German passenger cars in 1935, while Spain, Belgium, Italy and the Netherlands led in purchases of German trucks.

N. J. Truck Association Plans Newark Show in Nov.

The New Jersey Motor Truck Association is again sponsoring a national motor truck show to take place in Newark, Nov. 3 to 7, inclusive. This will precede the New York Automobile show which will open on Nov. 11.

The Society of Automotive Engineers has been invited to its National Transportation and Maintenance meeting in Newark at that time, and the National Associatioin of Motor Bus Operators has also been asked to hold its convention in Newark during the period. It is hoped that through these channels an unusually large group of automotive men will be in Newark for the show.

Pilot's Licenses Gain 6%; Aircraft 5% Over Year Ago

On April 1, 1936 there were 14,806 pilots and 7205 aircraft holding Department of Commerce licenses according to an announcement by the Bureau of Air Commerce. This compares with

Low Priced Car Output Off

First Quarter Shows Drop From Last Year, But Production of Medium Priced Group Doubled

Passenger Car Production by Wholesale Price Classes

(U. S. and Canada)

First three months 1936 and 1935 compared

	1936	1935	Per Cent Change	Per Cent of Total 1936	Per Cent of Total 1935
$500 and under	517,447	555,097	— 6.6	56.97	61.20
$501-$750	339,509	322,743	+ 5.1	37.38	35.57
$751-$1,000	36,582	17,602	+108.0	4.03	1.94
$1,001-$1,500	11,089	6,886	+ 61.1	1.22	.76
$1,501-$2,000	2,304	2,303	none	.25	.26
$2,001-$3,000	1,295	1,505	— 13.9	.14	.17
$3,001 and over	121	869	— 86.2	.01	.10
Total	908,347	907,005	+ 0.15	100.00	100.00

Truck Production by Capacities

(U. S. and Canada)

First three months 1936 and 1935 compared

	1936	1935	Per Cent Change	Per Cent of Total 1936	Per Cent of Total 1935
1½ tons and less	207,891	191,178	+ 8.9	94.85	94.67
2 to 3 tons	8,226	8,449	— 2.5	3.75	4.18
3½ tons and over	1,841	1,615	+ 14.1	.84	.81
Special and buses	1,226	694	+ 76.7	.56	.34
Total	219,184	201,936	+ 8.5	100.00	100.00

13,886 pilots and 6855 aircraft licensed a year ago.

Among those holding pilots' licenses were 7144 transport, 842 commercial, 6085 private, 733 amateurs and 2 industrial pilots. The last class is no longer issued. Also among the license holders were 404 women.

First Quarter Accidents Fewest in GM's History

Factory workers in General Motors plants met with fewer accidents at their work during the first three months of 1936 than in any other three months' period in the history of the corporation, according to reports just compiled from 74 plants in the United States and Canada.

During the first three months of this year, there were only 4.88 lost-time accidents for every million hours worked in General Motors plants, the lowest accident rate in the history of General Motors for any 90-day period. It represents a safety improvement of approximately 38 per cent compared to the first quarter of 1935, despite a substantial increase in hours worked this year.

In the severity of accidents reported for the first quarter of 1936, there were only .549 days lost for every thousand hours worked, an improvement of 21 per cent over the same period of 1935.

British Company Granted Hercules Diesel License

Ruston & Hornsby, Ltd., of Lincoln, England, have completed a license agreement with the Hercules Motors Corp. of Canton, O., whereby they will build in England the Hercules line of light-weight, high-speed Diesel engines.

The British product will be known as the Ruston (Hercules Type) engine. At least one model is likely to be in production in the near future.

FTC to Hold Conference On Tire Trade Practices

Elimination of misbranding, price discrimination and other practices will be asked at a trade practice conference for the rubber tire industry which will be held by the Federal Trade Commission. The commission announced that while the time and place for the conference have not been determined, it is likely it will be early in June at some central point in the Middle West, probably Chicago.

Application for the conference was made late last year on behalf of independent retail dealers by the National Association of Independent Tire Dealers. However, all branches of the industry have been circularized by the commission and, according to the commission, are expected to participate.

The commission stated that in the rubber tire industry are approximately 50,000 independent retail dealers, about 45,000 gasoline stations at which tires are sold, nearly 1750 company-owned stores, nearly 1400 chain and mail order stores and about 30 tire manufacturers. Invested capital in the rubber tire industry was placed at approximately $2,000,000,000, with an annual business volume of substantially $750,000,000. The estimated number of employees was said to vary between 150,000 and 250,000.

S.A.E. Handbook

1936 Edition Lists New Standards, New Specifications

The 1936 edition of the S.A.E. Handbook has just made its appearance. It includes all current standards and recommended practices of the society, a list of officers and members of the council, the personnel of the 1936 Standards Committee and of 1936 Sectional Committees, an extract from a report to the president and council dealing with standardization procedure, and miscellaneous tabular material.

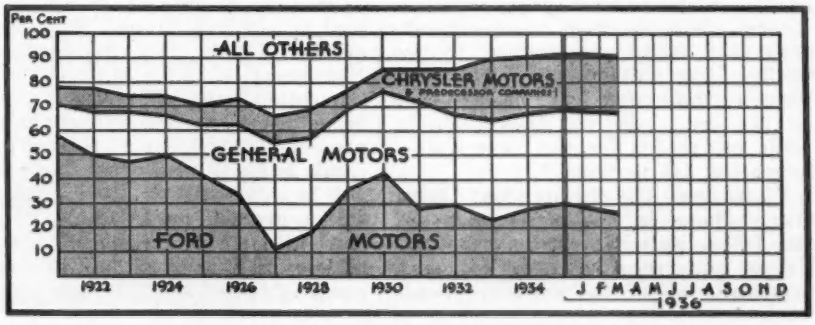
It seems that since the appearance of the last previous edition of the handbook, five new standards were adopted, six specifications were revised, two were corrected and ten were canceled. The new specifications include the following: storage-battery life tests, electric-lamp bulbs for aircraft, modified thread form for tube fittings, No. 660 bearing bronze, and Woodruff key-slot cutters and gages. With each edition the handbook grows slightly more "portly," and it now contains almost 800 pages.

March Retail Sales Index

The preliminary index figure of the Bureau of Foreign and Domestic Commerce of retail new car sales for March stood at 100.5 on the basis of the 1929-1931 average as 100. The figure is adjusted for number of days and seasonal movements. In February the index was 89.5 and in March, 1935, was 94.5.

Passenger Car Production by Manufacturing Groups

(Revised to Include First Quarter of 1936)



Union Probation Ended

(*Continued from page 617*)

eral vice-president, and Ed Hall, general secretary-treasurer of the provisional executive staff set up last August, were leaders of the opposition to Dillon.

The assembled delegates accepted cheerfully Green's recommendation that a temporary presiding officer be elected to act until the credentials committee had made its report and delegates were duly seated, "after which, permanent officers should be elected before proceeding to the transaction of any other business." Without opposition, Homer Martin was promptly chosen temporary chairman.

An early test of the strength of the so-called progressive group—the Martin-Mall faction—came at the close of the first day, when the convention considered the status of more than 7000 members of the General Automobile Workers' Union of Toledo which had sent 37 delegates to the meeting. The delegates in question represented the Toledo organization which had been chartered last February by Martin and Hall without Dillon's knowledge. The "progressive forces" easily prevailed and the Toledo delegates were seated.

Each Has a Pamphlet Report

Individual pamphlet reports were submitted by Dillon, Martin and Hall. With documentary evidence in the form of reproductions of correspondence, Dillon went to great length in his report to explain how the Toledo charter come to be issued by Martin and Hall and to justify his own position in the whole matter.

Dillon's report also contained a record of profits made during 1934 and 1935 by the 13 leading automobile manufacturers and 27 representative automobile parts companies in the United States. It showed the car manufacturers increased their net profits 148 per cent during 1935 over 1934 while the parts manufacturers increased net profits 141 per cent during this period. Salaries of some 150 automotive executives were listed, along with "gifts" made by such executives in the form of stock.

"While those who have been selected to manage and direct the operation of the various units of the industry have been adequately compensated for their services," he points out, "the figures of the U. S. Bureau of Labor Statistics reveal that the automobile industry has during 1935 increased total expenditures for wages—the return to the workers who build the cars and make possible these fabulous profits—only 32 per cent over its 1934 payrolls, while net profits for the owners were increasing 148 per cent."

Discussing the independent labor organizations in the motor industry, Mr. Dillon stated in his report: "Numerous conferences have been held with practically all of the executive heads of these groups in an effort to bring about unity of purpose upon a practical basis and to establish but one practical and useful organization of labor in the automobile industry under the laws and policies of the A. F. of L. I regret that we have been unable to completely accomplish this, but I can report that substantial progress has been made in this direction, and I predict that in the not far distant future the forces which we have set in motion will contribute substantially to the final accomplishment of this desired result upon a mutually satisfactory basis."

Martin is for Action

Homer Martin made only a brief report summarizing his activities, touching also upon the subject of independent unions. On this point he said: "I have sought consistently to bring about a better understanding and cooperation leading to the elimination of these unions through their affiliation with the International Union."

That an intensive organizing campaign will be launched after the convention is indicated in the Martin report. "I have endeavored," he says, "to promote an organizational campaign, not only in Detroit but also in Pontiac, Flint and Lansing, and plans are now being laid for a systematic and intensive organization campaign for these and other cities in the State of Michigan throughout the coming months."

The report of Ed Hall listed among other things donations amounting to $1334 to the striking Motor Products local and $516 to the Walker-Ajax and Fruehauf Trailer locals.

Having in mind, no doubt, the factional disputes and dissension that divided the official staff he had set up last August, Green devoted a considerable part of his address to the subject of self-government and the necessity for abiding by the decisions of the majority. "When the majority decides and a verdict is rendered upon your constitution and upon the election of your officers, upon organization procedure, then I say it is the duty of the minority as well to go out and carry out the decisions of this convention, and let those decisions stand until the next congress meets, and then change it if you wish," he said.

"Upon your jurisdiction, my friends, the convention of the A. F. of L. decided —the Council first, and then on an appeal to the convention. Another convention will be held in Tampa next November. If you wish to come to that convention with your appeal you will be accorded the widest opportunity to present it. . . . But until further modification is made, your great organization will be called upon to observe the jurisdiction granted you by the A. F. of L."

A full slate of five general executive officers was elected at Wednesday morning's session. Reflecting the work of pre-convention caucusing and the preponderant strength of the "progressive" element headed by Homer Martin, the election was a mild affair that went off smoothly. Without opposition, Homer Martin was elected president. Russell Merrill, of Studebaker, a conservative, had been nominated but declined to run and it was moved to instruct the secretary-treasurer to cast a unanimous ballot for Martin.

Indicative of the relative strength of the two factions, Wyndham Mortimer, Cleveland, of the "progressive" group, defeated Russell Merrill for the office of first vice-president by a vote of 138 to 90. Carl J. Shipley, of the Bendix local, was also a candidate, receiving only 3.6 votes. Ed Hall, former secretary-treasurer, won the post for second vice-president over John Milkent, of Kenosha. Merrill had also declined a nomination for that office. The vote was 179 to 59. Walter N. Wells, of Detroit, was elected third vice-president by a vote of 132, defeating Alton Green and L. R. Richardson, both of Studebaker who received 95 and 7 votes respectively. Sentiment was so strong for George Addes, of Toledo, as secretary-treasurer that he was elected to that position by acclamation of the convention.

The convention was thrown into a furore Tuesday when a delegate called attention to an article in the Chicago *Herald Examiner* of April 28 bearing the headline: "Forty Thousand Auto Workers Quit Labor Federation—Green Appointee Out As President." It was promptly voted to dispatch a telegram to the *Herald Examiner* repudiating that publication "on account of this false and misleading statement," and to notify other press services that the headline is an untruth and requesting the publication of the true facts. Further, because of their anti-union stand, all Hearst papers were placed on the "unfair list" by a resolution read at the Wednesday session.

"Communist Party" Letter Read

Another incident that caused excitement was the circulation among delegates of a letter with the signature "Communist Party." The letter advocated the election of Martin and Mortimer as president and vice-president, stating that both had the Communists' fullest support. It urged that "strikes be called often and handled with courage so that the bosses will know what we mean." Martin, who read the letter to the convention, said: "We are convinced the source of this communication is either the manufacturers or their representatives." He also read a telegram from the general secretary of the Communist Party declaring the letter a forgery.

A telegram from John L. Lewis extended to delegates of the U.A.W. convention fraternal greetings on behalf of the United Mine Workers of America and the Committee for Industrial Organization, pledging their cooperation.

(Above, left to right) L. C. Hill, Murray Corp. of America; C. L. McCuen, president and general manager, Olds Motor Works; and Peter Altman, chairman of the Detroit Section.

(Above) W. F. Pioch, Ford Motor Co.

(Left) Group of Olds Motor Works engineers.

(Above) D. J. Vail, Campbell, Wyant and Cannon Fdy. Co.

At The
S.A.E. Production Meeting

(Above, left to right) D. A. Wallace, vice-president in charge of manufacturing, Chrysler Corp.; T. P. Archer, vice-president in charge of operations, Fisher Body Corp.; and John A. C. Warner, S.A.E. secretary and general manager.

(Left, from left to right) W. H. McCoy, manager of machine shops, General Motors Research; Fred W. Cederleaf, Ex-Cell-O Aircraft and Tool Corp.; and E. H. McCarty, president of the Nash Motors Co.

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for AUTOMOTIVE INDUSTRIES

Several branches of industrial activity continued to improve last week. Department and other retail stores reported higher earnings than those a year ago. Further business improvement is in prospect in the Southern sections of the country, and increased employment is expected to attend the larger cotton and tobacco crops.

The Guaranty Trust Co.'s index of business activity for March stood at 76.8, as against 79.5 the month before and 74.3 a year ago. The company's index of wholesale commodity prices on April 15 was 54.5, as against 54.1 a month earlier and 53.1 a year earlier.

Carloadings Continue to Rise

Railway freight loadings during the week ended April 18 amounted to 642,657 cars, which marks an increase of 20,519 cars above those in the preceding week, a gain of 31,516 cars above those a year ago, and a rise of 50,952 cars above those two years ago.

Building 62% Above Last Year

Construction contracts awarded in 37 eastern states during March, according to the F. W. Dodge Corp., were 40 per cent above those during the preceding month and 62 per cent above those in the corresponding period last year. Total residential building contracts awarded in the first quarter of this year were 75 per cent above those a year ago.

Chain Store Sales Up

Sales of 27 chain stores, including two mail order houses, during March were 6.5 per cent above those in the corresponding period last year. Sales of these same companies during the first quarter of this year were about 7.3 per cent above those in the first quarter in 1935.

Electric Output Declining

Production of electricity by the electric light and power industry in the United States during the week ended April 18 was moderately below that during the preceding week but marked a gain of 12.5 per cent above that in the corresponding period last year.

Fisher's Index

Professor Fisher's index of wholesale commodity prices for the week ended April 25 stood at 82.5, as against 82.6 the week before and 82.5 two weeks before.

Federal Reserve Statement

The consolidated statement of the Federal Reserve banks for the week ended April 22 showed a decline of $1,000,000 in holdings of discounted bills. Holdings of bills bought in the open market and government securities remained unchanged. Money in circulation declined $17,000,000, and the monetary gold stock increased $9,000,000.

sustaining strength," he said, "because it rests on the facts that Poland has no foreign trade restrictions, has a balanced budget, stable money and an active foreign trade. Although it has an adverse trade balance with the United States, it is not interested in curtailing its imports, but in further increasing them through greater exports to the United States," he added.

Wind Helped Racer

Long Straightaways May Necessitate Revision of Contest Rules

Ten thousand troops were used to guard the motor highway from Frankfort to Heidelberg, when Hans Stueck, driving an Auto Union 16-cylinder racing machine, recently set up five world's and three international class records, for which international recognition has been accorded.

The class records, for five kilometers, five miles and 10 kilometers were put up by Ab Jenkins, last year, on the Bonneville Salt Flats, Utah. The German's average speeds for these distances were 194.13, 180.84 and 179.33 m.p.h. respectively. The five world's records which are claimed were held by G. E. T. Eyston, also on the Utah salt flats, for distances, of 10 miles, 50 kilometers, 50 miles, 100 kilometers and 100 miles. The highest speed attained by Stueck was 177.99 m.p.h. for the 10 miles. Stueck drove a 16-cylinder, supercharged rear-engined car of 75 x 85 mm. bore and stroke, for the design of which Engineer Porsche was responsible.

The road construction program

(Turn to next page, please)

New Metal-Bonding Process Announced by British Firm

A new metal-bonding process is reported to have been invented by F. F. Gordon, a director of the firm of Speak & Jackson, Ltd., Sheffield, England. Details of the process are not being given out as yet. It is claimed that any two metals whose melting point is in the neighborhood of 1200 deg. Centigrade can be bonded together and after bonding they can be worked and heat-treated as if they were one. A good example of the application of the new process is said to be that to cutters of wood-working machines. These cutters can be made of a tough steel faced with high-speed steel on one side. Since the regrinding is diametral, the cutting edge is always preserved. The cost of a bonded cutter probably is materially less than that of a solid steel cutter of equal quality.

The above report, which has been cabled to this country from England, reminds one that a bonded laminated steel is being produced in this country under the name Ingaclad by the Ingersoll Steel & Disc Co., Chicago. Ingaclad consists of mild steel with a thin covering of stainless steel and is claimed to give the rust-resisting qualities of solid stainless steel at reduced cost.

Car Exports to Poland Will Rise, Says Banker

"Two factors point to an increase in purchases of American automobiles in Poland," said Joseph Jakubowski, director of the Warsaw Chamber of Industry, on a tour of the United States with a group of Polish bankers and industrialists. "One is the greatly increased allotment in the budget for construction and improvement of roads throughout the country, and the second is the applications of Ford and General Motors for licenses to erect assembly plants in Poland.

"Economic recovery of Poland has

40 Years Ago

with the ancestors of AUTOMOTIVE INDUSTRIES

Aluminum in Motor Vehicles

The horseless age is fortunately contemporaneous with the aluminum age, and this latest discovery in the metal industry is likely to play an important part in the development of the motor vehicle industry.

Lightness and strength combined are the great desideratum in motor vehicle construction and as the aluminum alloys weigh only about one-third as much as iron of the same bulk, it will be seen that the new metal is admirably adapted for the purpose.

The Pittsburg Reduction Co., the largest manufacturers of aluminum alloys in the country, have had many calls upon them of late from builders of motor vehicles.

—From *The Horseless Age*, May, 1896.

undertaken by Germany has revealed a weakness in the present international rules governing automobile speed records. Under these rules the run has to be made in both directions, when the distance is not greater than 10 miles, in order to cancel out any advantage which may be obtained from the wind. When this rule was established it was never imagined that highways more than 10 miles in length would be available for record attempts. Now that Germany possesses motor roads dead straight for distances up to 100 miles, and may have even longer roads in the near future, there is every incentive to take advantage of the wind when attempting a speed record. To circumvent this, the European delegate of the Contest Board of the A.A.A. has proposed to the international association that all record runs, whatever the distance, be made on either a closed circuit, or out and home.

Automotive Metal Markets

With Automotive Steel Buying Remaining Steady, Building Needs Boost Rate to 71.2%

What remains of the unfilled portion of first-quarter automotive business on steel mills' books consists to a considerable extent of sheet and strip steel specifications, shipping of which buyers asked to be subordinated to the expediting of deliveries of more urgently needed material that was ordered in April.

Bearing in mind the time necessary to finish body-stock, some automotive consumers have not only covered their May requirements of automobile sheets, but to some extent have also anticipated their June needs. Buying of cold finished steel bars by automotive consumers is consistent, without being spectacular, little time elapsing between specifications and shipping. The movement of bolts and nuts into automotive consumption is much along the same lines.

Interpretation of the shipment "at one time" condition as a basis for quantity discounts to mean shipment within one and the same calendar week appears to have become general, and both flat steel producers as well as buyers seem to be satisfied.

Announcement of the proposed merger of a non-integrated strip mill with a neighboring plant that is self-contained in furnace equipment for the making of primary steel, is accepted in the steel market as evidence pointing to the gradual disappearance of rolling mills that must buy their semi-finished steel in the open market.

Further increase by approximately 1 per cent in this week's employed ingot capacity, which the American Iron and Steel Institute reports at 71.2 per cent, is attributed to slightly better takings of steel by the construction industries. With Detroit furnaces and finishing mills operating at top-capacity, it is clearly seen, however, that the backbone of steel consumption still consists of the demand from automobile manufacturers and parts makers.

Pig Iron—In some of the Middle West markets, April business ran ahead of that in March, while in others it fell behind, due largely to some automotive foundries having carried over reserves from their first quarter purchases, while others confined their buying to single carloads, there being no special inducement for them to cover ahead. Prices are steady and unchanged.

Aluminum — The market for secondary aluminum is a shade easier, due to the freer supply of scrap, emanating from automobile plants. The primary situation is unchanged and routine in character.

Copper—In the absence of fresh consuming demand, the market rules dull, with 9⅛ cents, delivered Connecticut point, the quotation of producers, while in the "outside" market there are reported to be sellers at 9⅜ cents.

Tin—The market is quiet and steady, spot Straits tin selling at the beginning of the week at 46⅝ cents, slighty higher than at the preceding week's close. Ford Motor Co. is frequently reported these days as in the market for 25-ton lots.

Lead—Although demand is on the uptrend and the second largest marketer refrained from making any offerings, prices were unchanged at the opening of the week. An advance, however, is freely predicted. Storage battery manufacturers, among the largest consumers, have so far been offish in covering May requirements.

Zinc—Steady and quiet.

Nash Branch Formed to Handle Chicago Sales and Service

Nash Motors Co. announced last week the organization of the Nash Michigan Avenue Co., headed by S. L. Davis. The new company will establish sales and service for Nash and La Fayette on Chicago's automobile row. The operation of the new corporation as a unit of the Nash sales organization went into effect on Friday. Mr. Davis, who heads the new corporation, has been prominent in Chicago automobile activities since 1914 when he joined the automobile and accessories department of Butler Brothers, wholesale merchandisers.

Greenfield Tap & Die Co. Buys J. M. Carpenter Plant

The Greenfield Tap & Die Co., Greenfield, Mass., has purchased the J. M. Carpenter Tap & Die, Detroit, branch of the Whitman and Barnes Corp., and oldest concern of its kind in the United States. The plant will be operated in Detroit by the Greenfield Co. with Alfred LaPierre as manager.

Calendar of Coming Events

SHOWS

Yugoslavia, Automobile Show, Zagreb, May 2-11
Foundry and Allied Industries Exposition, Detroit .....May 4-9
Spain, Automobile Show, Madrid, May 10-20
International Aero Exhibition, Stockholm, Sweden .....May 15-June 1
International Petroleum Exposition, Tulsa, Okla. .....May 16-23
Morocco, Fair of Tangiers.....May 16-24
Yugoslavia 16th International Spring Fair, Lubliana .....May 30-June 11
France, Automobile Exhibit at Foire de Paris .....May
Norway, Automobile Show, Oslo .....May
Olympia Motor Show, London, England, Oct. 15-24
National Motor Truck Show (N. J. Motor Truck Assn.), Newark, N. J., Nov. 3-7
National Automobile Show, Grand Central Palace, New York.....Nov. 11-18
International Aviation Show, Paris France .....Nov. 13-29
Columbus Automobile Show.....Nov. 14-20
Chicago Automobile Show.....Nov. 14-21
Detroit Automobile Show .....Nov. 14-21
Washington, D. C., Automobile Show, Nov. 14-21
Cincinnati Automobile Show ....Nov. 15-21
St. Louis Automobile Show.....Nov. 15-22
Baltimore Automobile Show ....Nov. 21-28
Brooklyn Automobile Show ...Nov. 21-28*
Cleveland Automobile Show.....Nov. 21-28
Kansas City Automobile Show..Nov. 21-29*
Milwaukee Automobile Show ....Nov. 22-29
Peoria Automobile Show ..Nov. 30-Dec. 5*
Philadelphia Automobile Show, Nov. 30-Dec. 5*
Natl. Exposition of Power & Mechanical Engineering, Biennial Meeting, New York City .....Nov. 30-Dec. 5
International Commercial Motor Transport Exhibition, London, England, November

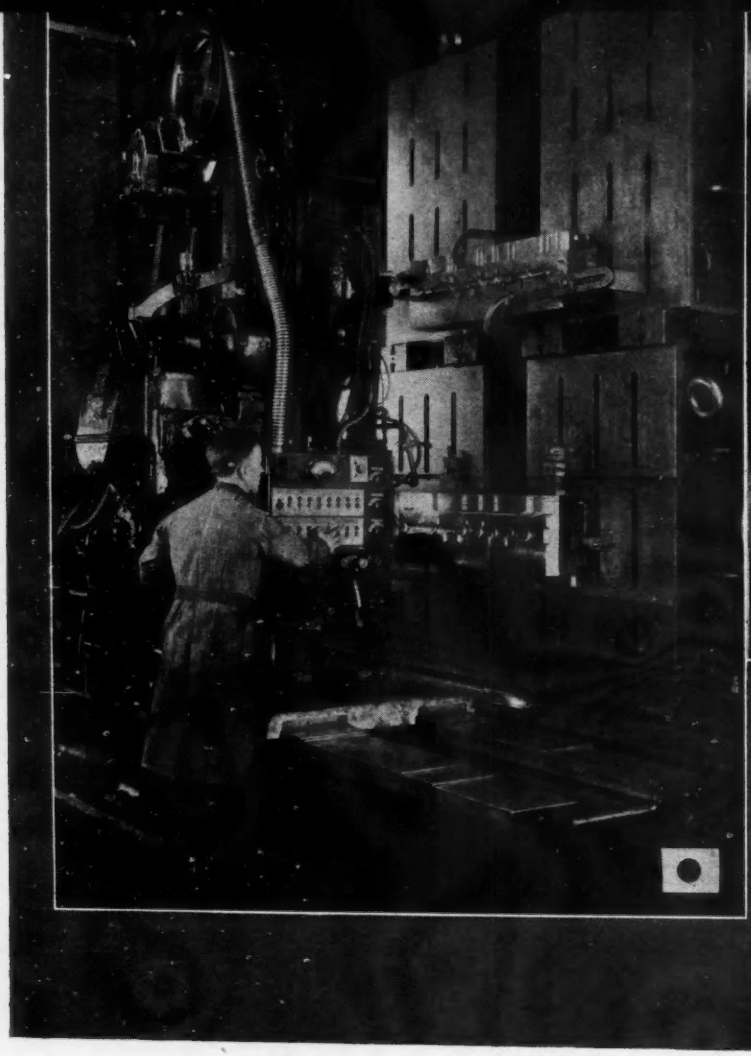
* Tentative dates.

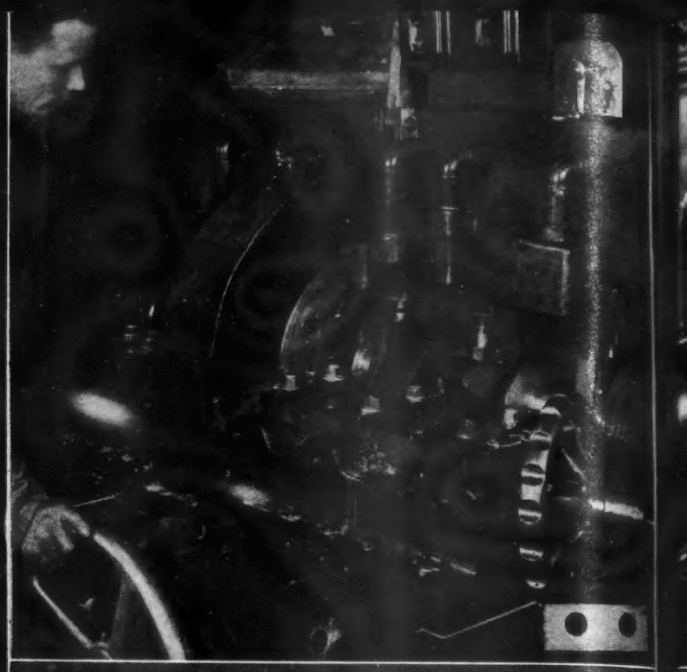
CONTESTS

500-Mile International Sweepstakes, Indianapolis .....May 30

CONVENTIONS AND MEETINGS

American Foundrymen's Association 40th Annual Convention, Detroit, May 4-9
Second Dearborn Conference of Agriculture, Industry and Science, May 12-14
American Petroleum Institute Mid-Year Meeting, Tulsa, Okla..May 13-15
National Battery Manufacturers Association, Spring Convention, Cleveland .....May 20-21
American Iron & Steel Institute, Annual Meeting, New York City..May 21
S.A.E. Summer Meeting, White Sulphur Springs, W. Va. .....May 31-June 6
Automotive Engine Rebuilders Assoc. Annual Convention, Cincinnati, June 1-4
American Society for Testing Materials, Annual Meeting, Atlantic City .....June 29-July 3
National Association Power Engineers, Annual Meeting, Chicago, Aug. 31-Sept. 4
American Society for Metals, 18th Nat'l Congress, Cleveland, O. ....Oct. 19-23
American Gas Association, Annual Meeting, Atlantic City .....Oct. 26-31
American Petroleum Institute, Annual Meeting, Chicago .....Nov. 9-12
Natl. Industrial Traffic League, Annual Meeting, New York City....Nov. 19-20





● Keller machine working on 120 camshaft die.

● ● One of the new Wickes center drive crankshaft lathes rough-turning main bearings on 120 crankshaft.

by Joseph Geschelin

Packard's 88 Acres of Production

FOR an inspiring saga of the automotive industry consider the history of the Packard Motor Car Company.

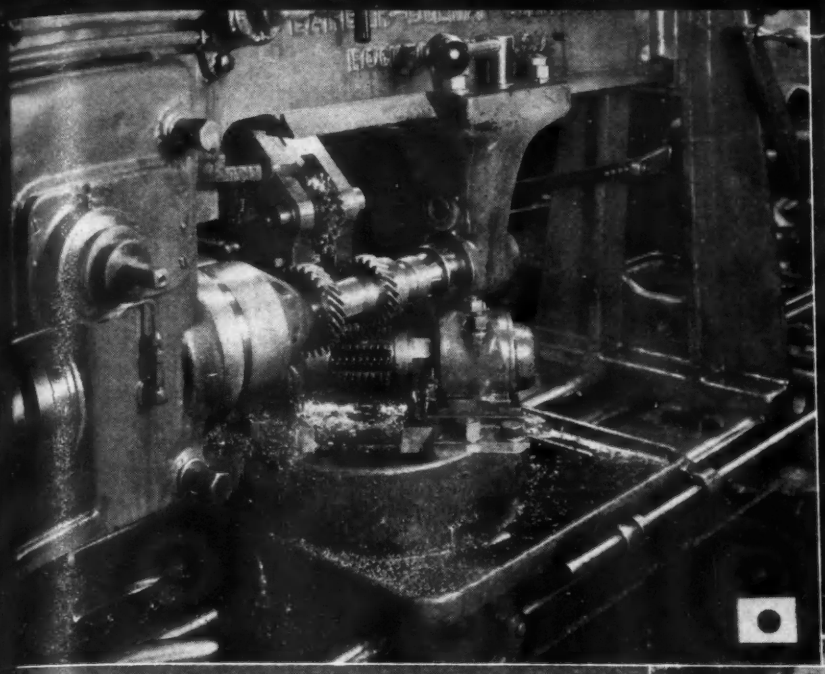
The first Packard car was completed on Nov. 6, 1899, at Warren, Ohio, and for 35 years the Packard name was associated with the finest motor cars in the world in the highest price brackets. Then, in 1934, breaking with all tradition, Packard conceived the idea of a brilliant car—the Packard 120—priced lower than any line in the recent history of the company. In 1928 Packard had set its all-time high in producing 50,054 units of the high-priced cars; in 1935 it produced 52,256 units, of which the major portion were the newly introduced 120's.

When the die was cast in favor of the 120 car, the organization embarked on the most significant program in its entire existence. It was realized at the outset that the Senior line of high-priced cars and the 120 line of medium-priced cars should not and in fact could not be built in the same factory by the same group of men. Wisdom dictated the need for two separate establishments—one for the Senior with more or less universal type of manufacturing equipment and skilled craftsmanship associated with almost hand-made cars; and an entirely different plant tooled and manned for large scale production consistent with a moderately priced car.

The big move was initiated about the middle part of 1934. And its momentum produced not only one of the most interesting plants in the industry—the 120—but it effected a profound change in the production facilities for the Senior line. It resulted in a general house cleaning, a complete realignment of equipment and departmental layout, and a general simplification and improvement in the manufacturing procedure on the Senior line.

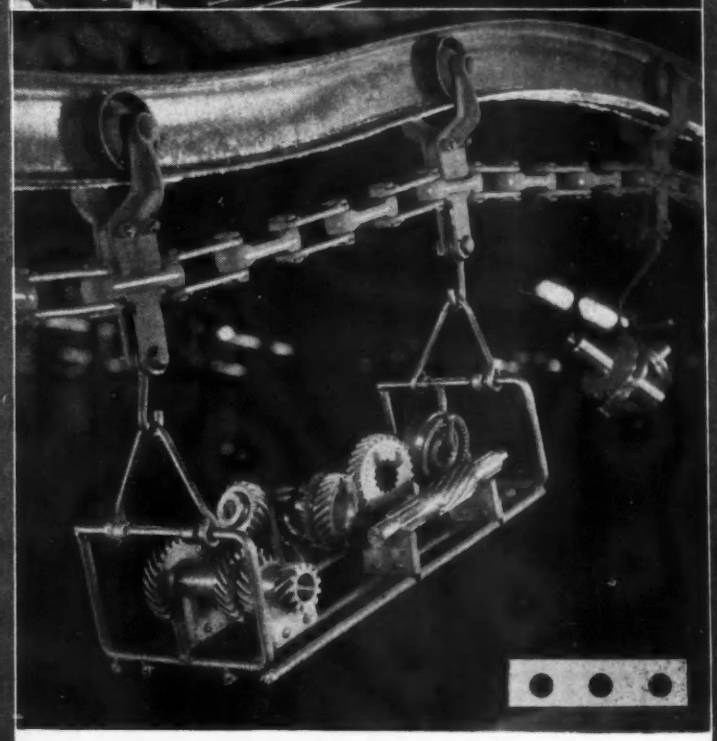
It was in fact one of those moves that mark the birth of a new enterprise.

Today the visitor to the Packard plant will find two separate automobile establishments, completely divorced from each other except for certain facilities and manufacturing operations common to both. Each factory is self-



● Each machine of the battery of seven Barber-Colman hobbing machines used in the production of helical gear transmission sets is provided with a special Packard burring attachment. This comes into play automatically as the finishing cut is completed, burring both ends of the gear tooth.

● ● Oilgear vertical broaching machine used for broaching the sides and nut seats of connecting rod bosses. Produces 240 pieces per hour with surface speed of 20 ft. per min. of broaching tool.



● ● ● Close-up of transmission feeder line in Packard 120 factory. Individual trays carry complete sets of transmission gears which have been matched and run in, and are on the way to the assembly line.

Efficiency

contained and each has its own body plant completely equipped for metal finishing, metal cleaning, welding and assembly, painting, trim manufacture, and body trimming. And it is Packard's boast that each of these factories builds more of the automobile than any single motor car factory in America. You can best judge the implications of this statement in the light of what is disclosed in this study.

The factory as a whole extends a full mile along the inner belt line on the east side of Detroit. It has a total ground area of 78.31 acres and the total floor space of the buildings is 88.05 acres. There are 76 major factory buildings.

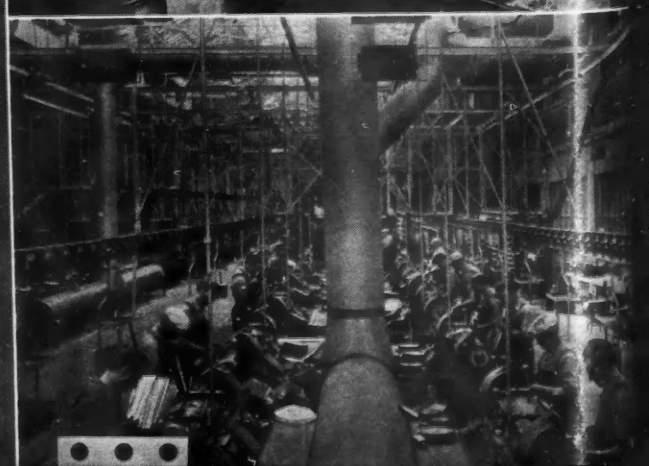
Operations for two lines of models synchronized through departments, some of which are distinct for each line and some common to both

Packard Motor Crankshaft

Operation	Equipment
Mill locating spot on cheeks No. 1, No. 8, No. 12	Productomatic Mill No. 120
Finish face all main brg. cheeks. Rough face all main brg. walls. Rough face flange, oil thrower & frt. end. Rough turn all main brgs., frt. end, flange & oil thrower. Rough face both ends	Wickes Duplex Crank Lathe Thor Balancer
Finish face all main brg. walls. Finish face frt. end. Flange & oil thrower. Finish turn all main brgs. Turn frt. end. Turn flange. Turn oil thrower.	Wickes Duplex Crank Lathe Thor Balancer
Finish all pin brg. cheeks. Rough & finish all pin brg. walls. Rough & finish all pin brgs.	No. 6-AC LeBlond Lathe No. 6-AC LeBlond 2-spd. Auto Variable speed drive lathe
Drill No. 22 (.157 in.) oil hole 7/16 deep in Nos. 1-3-7 pin brgs.	Frocess Eng. Co. Horiz. Auto Drill
Drill No. 22 (.157 in.) oil hole 7/16 deep in Nos. 2-6-8 pin brgs.	Frocess Eng. Co. Horiz. Auto Drill
Drill oil holes in Nos. 1-8 pin brgs.	No. 2-14 Leland-Gifford Drill 2-Spd. Head
Drill oil hole in No. 7 pin brg.	No. 2-14 Leland-Gifford Drill 2-Spd. Head
Drill oil holes in Nos. 3-6 pin brgs.	No. 2-14 Leland-Gifford Drill 2-Spd. Head
Drill oil holes in Nos. 4-5 pin brgs.	No. 2-14 Leland-Gifford Drill
Drill oil hole in No. 2 pin brg.	No. 2-14 Leland-Gifford Drill 2-Spd. Hd.
Drill oil holes in Nos. 4-5 pin brgs. & No. 3 main brg.	No. 2-14 Leland-Gifford Drill
Chamfer oil holes	(1) Type U-20-¼ in. Light Duty (Thor) Universal Elec. Drill with 3 jawed chuck
Blow out oil holes	Flex. Power Press
Straighten	Boye Emmes Lathe
Recenter both ends	Thor Balancer
Finish grind center main brg. & walls	14 in. x 50 in. Norton Grinder
Finish grind (2) intermediate brgs. & walls	14 in. x 50 in. Norton Grinder Pratt Grinding Gage (comp.)
Finish grind No. 1 main brg. and walls	10 in. x 50 in. Norton Grinder Pratt Grinding Gage (comp.)
Finish grind rear main brg. & walls	14 in. x 50 in. Norton Grinder Pratt Grinding Gage (comp.)
Finish grind frt. end	14 in. x 50 in. Norton Grinder Pratt Grinding Gage (comp.)
Finish grind pilot & face of flange	10 in. x 50 in. Norton Grinder
Finish grind oil thrower	14 in. x 50 in. Norton Grinder
Finish grind No. 1-No. 8 pin brgs. & walls	Norton Pin Grinder (auto)
Finish grind Nos. 2-3-4-5-6-7 pin brgs. & walls	Norton Pin Grinder (auto) Norton Pin Grinder Mod. B1
Mill keyway in frt. end	No. 2 Kent-Owens Hand Mill
Drill 11/16 dia. c'sink & tap frt. end. Drill, undercut, chamfer, ream & tap (6) holes in rear end	Natco Horiz. Drilling & Tapping Machine
Mill hole in rear end, cut oil thrower thds. & polish walls of center main brg.	Schraner Spec. Mach. Hall Planetary Mill
Remove burrs, stone oil holes	
Repair when necessary	Boye Emmes Lathes
Straighten	
Inspect	

And of these the following are common to both the Packard 120 and Senior lines: Iron foundry, aluminum foundry, forge shop, plant engineering and maintenance factory, complete wood-working mills, chemical and testing laboratories, heat treating departments, stamping factory, die shop, power house, engineering research and testing laboratories, engineering shops in themselves capable of building an automobile, complete metal finishing and plating plant, and service department.

We might mention at this point that the plating department, a new venture born of the activity of 1934, represents the most modern plant of its kind in the industry. It comprises facilities for polishing and plating the entire gamut of finishes known to the modern art—copper, nickel, chromium, cadmium, zinc. And it incorporates the best that is known of ventilating and air-conditioning technique to make this a good place to work in. How far they have succeeded is best illustrated by the fact



● **Building 120 front end sheet metal assemblies on floor conveyor merry-go-round. Each station on conveyor has a special mounting buck which carries all small fastenings required for the assembly.**

● ● **Tomkins Johnson "Clinchor" for assembly of special clinch nuts on vibration dampener drum, replacing original welded nut construction.**

● ● ● **Polishing department in new plating plant. High ceiling, spacious and light quarters combined with adequate ventilating and exhaust system make this a very comfortable work place for the operators. Note particularly the vast system of monorail conveyors that honeycombs the entire plant.**

that the men in the plating department are just as comfortable as they are in any other part of the plant. And that's saying a lot to anyone familiar with the usual plating shop conditions.

Packard maintains its own proving grounds located two miles north of Utica and 20 miles north of the Packard plant. Here Packard has a million-dollar investment, with more than 500 acres of land and every possible equipment for testing cars. This includes many miles of bad roads, sand pits, and a 2½-mile concrete speedway, which holds the record as the fastest circular track in the world.

Packard employs regularly an average of 8700 people. Of this number 54 per cent have been in continuous employment with the company for five years or more.

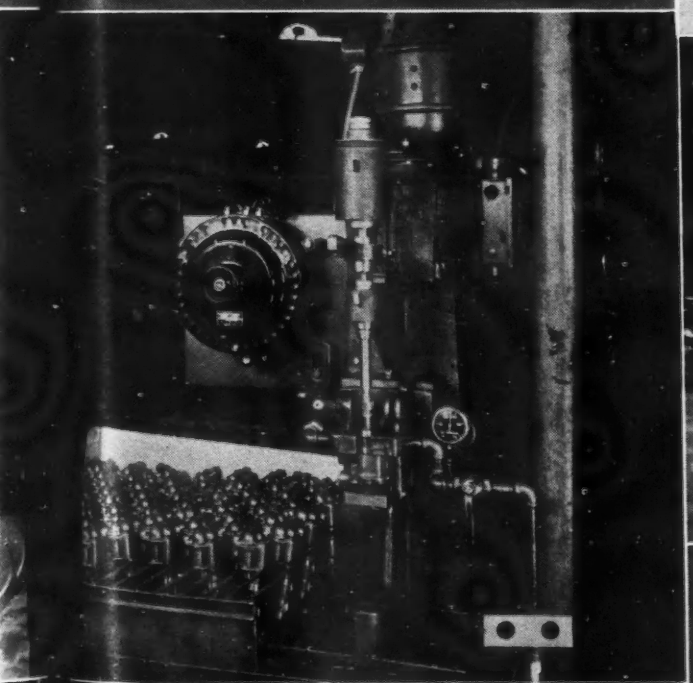
Since it is obviously impossible to create a word picture of this enterprise within the confines of any article, we have developed a pictorial treatment that should serve to give you a better

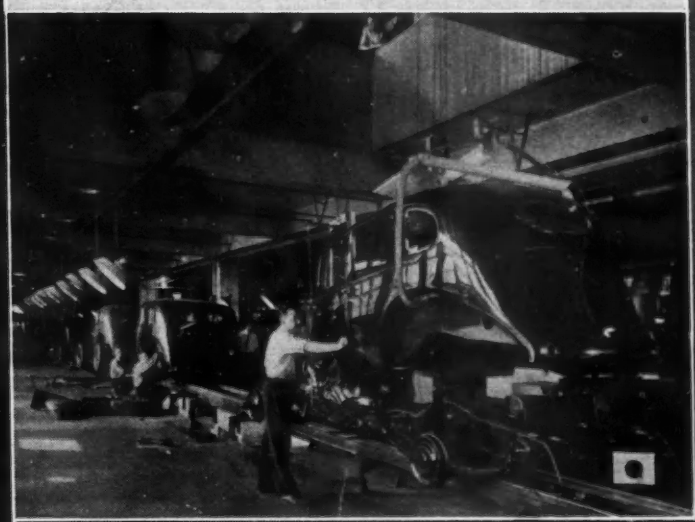
Packard Motor Connecting Rod and Bushing Assembly

Operation	Equipment
Weigh and segregate rods and caps, according to weigh, into four groups.	Toledo Scale—Style 4075
Select and assemble: Conn. rod cap Conn. rod bolts Conn. rod nuts	
Grind faces of both bosses parallel	2 Spdl. Blanchard Grinder Comb. fixtures for face sides.
Drill and ream crank pin and wrist pin holes	Natco Multiple Drill Press
Chamfer wrist pin hole	Bausb Multiple Drill
Chamfer both sides of crank pin hole	Cinn. Drill
Weigh & hollow mill large end	Garvin Horiz. Drill Toledo Scale, style 9226
Burr hole in crank and wrist pin hole	Haskins Portable Motor
Press in bushings and burnish wrist hole	Fox Double Ram Hyd. Press fixture
Chamfer bushings in small end	U. S. Reamer Drive
Burnish hole in small end	Fox Double Ram Hyd. Press
Weigh and hollow mill small end both sides	Garvin Horiz. Drill
Grind large hole	Heald Gagematic Grinder
Wash and blow out	
Diamond bore wrist pin hole	Two Spdle. Coulter Diamond Bore Mach.
Remove all burrs	U. S. Reamer Drive
Clean out oil holes	
Wash and blow off	
Inspect	Pratt & Whitney Hirth Inter. Compt. Toledo Scale for large end Toledo Scale for small end P & W Hirth Inter. Compt. gage—small hole Electrolimit gage

Packard Motor Connecting Rod and Cap

Operation	Equipment
Check for straightness and straighten	
Chamfer one side of radius on small boss	Barnes drill press
Broach both sides of large boss and nut and bolt seats	Oilgear broach machine
Saw caps off leaving 0.0075 stock on joint face of cap and rod for finish grinding	Cinn. mill
Drill No. 56 and 30 oil hole in rod	2-Spd. Allen drill press
Drill and ream bolt holes in rod and cap	Model-C Natco Hyd. drill
C'sink bolt holes in rod and cap	2-Spd. Allen drill press ½ HSS TS drill 11½ inches lg.
Mill brg. lock grooves in rod and cap	Kent-Owens hand mill
Drill long oil hole through web	6 spdl. L & G drill
Wash	
Grind joint faces of rod and cap	No. 16 Blanchard 2-spd. Grinder comb.

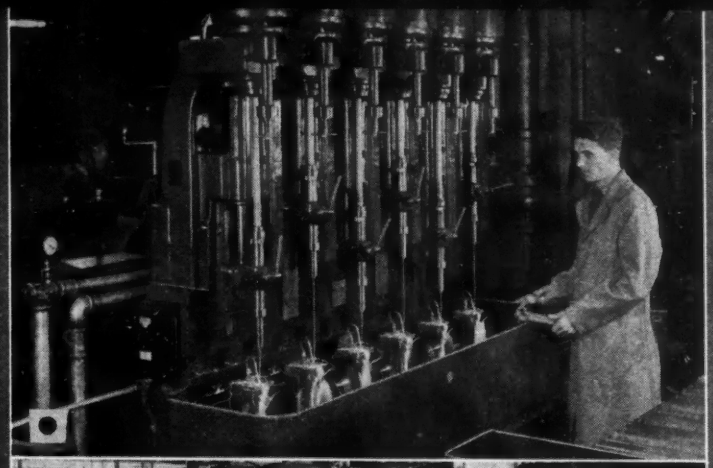




● View of Senior final assembly line taken at the body drop. The opening from the trim shop is directly overhead, the body fixture being handled by an overhead electric hoist.

● ● Engine oil pumps get 100 per cent production inspection on this machine. Delivery pressure is read directly on the gage at the right.

● ● ● Pyrotechnics in the 120 body plant. Flash welding balloon section.



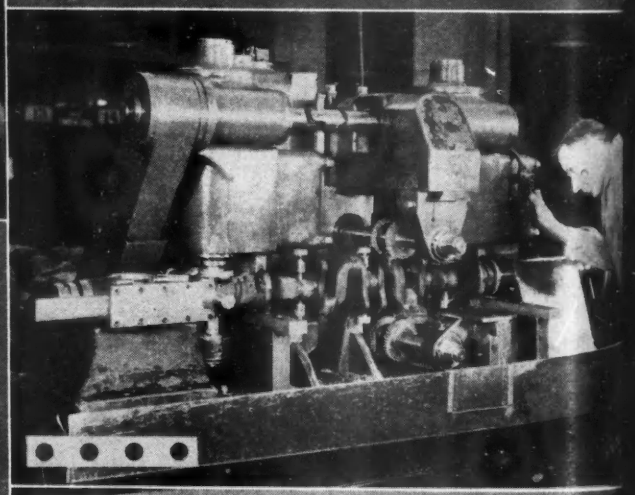
appreciation of its activities. By selecting analogous scenes and operations we are able to present a vivid contrast between the facilities for the Senior and the 120, remembering that each one is best fitted to do its own job most efficiently and most economically.

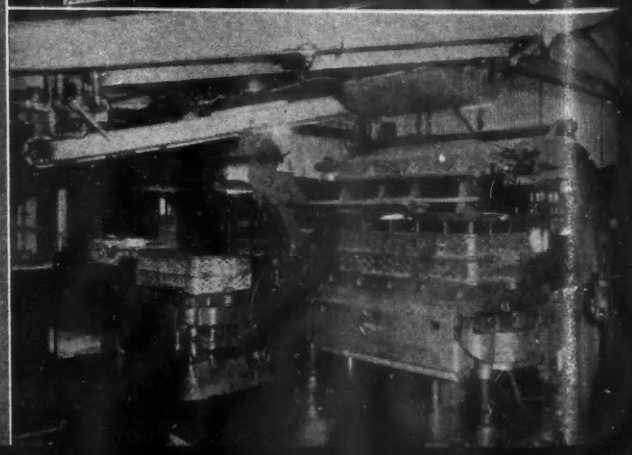
One small group in the pictorial section shows examples of materials handling, particularly in the 120 plant. Another small group illustrates some of the departments common to both the Senior and 120.

The 120 factory has complete machining facilities for the manufacture of engines, transmissions, steering gear, rear axle, and front wheel suspensions; also a great variety of miscellaneous parts for the chassis.

A self-contained body plant for the 120 is located on the upper floors of this factory. Packard makes its bodies completely, starting with the sheet metal which is formed in the stamping division and routed on endless conveyor chains to the metal-finishing departments. The body division is provided with facilities for metal finishing, welding, painting, and trimming. The latter embraces the making of seats, seat cushions, and the fabrication of other trim assemblies.

The 120 body plant is one of the most complete to be found anywhere in the





● Connecting rod oil gallery 7/32 in. diameter, 6½ in. long, drilled at the rate of 120 per hour (six spindles) on this six-spindle Leland-Gifford machine. The machine is fitted with the L-G step-by-step hydraulic feed mechanism which assures proper dull cooling and chip disposal. Feed, three inches per min., speed 1200 rpm. or 70 ft. per min.

● ● General view of Ingersoll cylinder block machining line in 120 factory. This is the beginning of the line with the Oilgear horizontal surface broaching machine for bearing locks in the foreground at the left.

● ● ● General view looking down the 120 engine line with banks of material and sub-assembly stations.

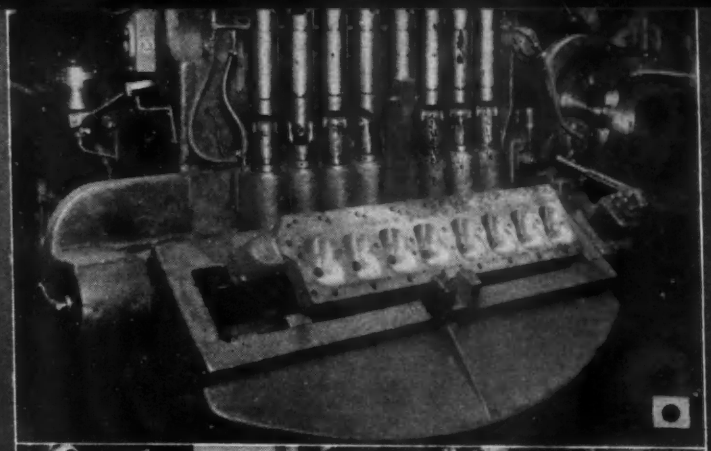
● ● ● ● New Productomatic heavy duty miller cutting eight locating spots simultaneously on the 120 crankshaft. Note the four pairs of cutters used.

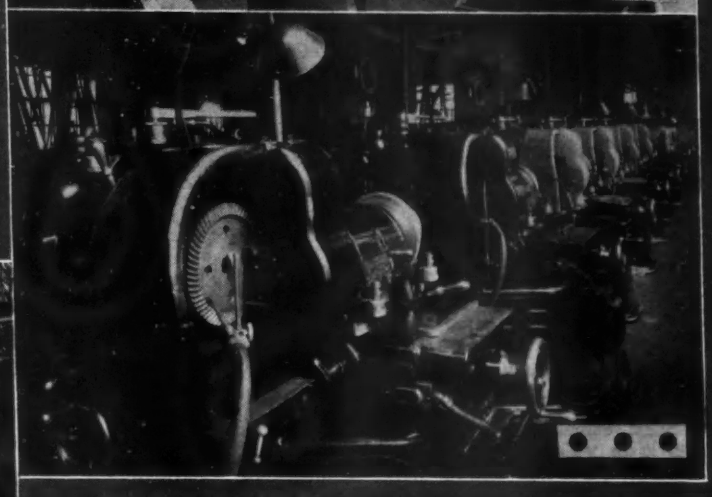
● ● ● ● ● Group of new Osborn molding machines in Packard foundry producing molds for 120 cylinder blocks.

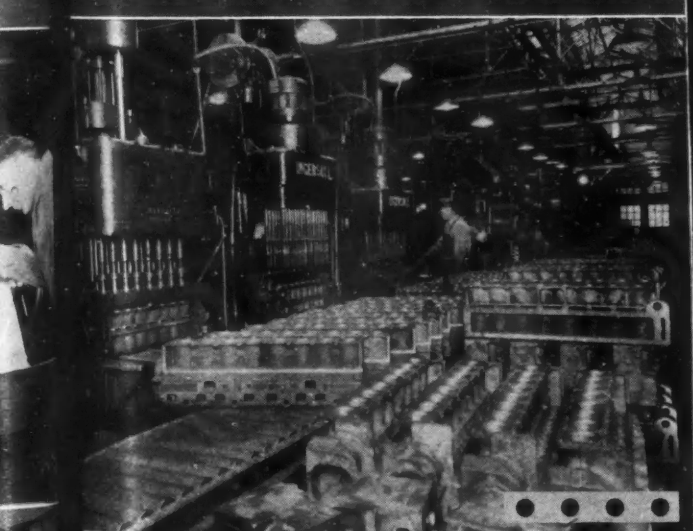
industry. It was probably the first to transport bodies from station to station while suspended from an overhead monorail conveyor, dipping and rising according to the nature of the operation at each point. Advantage has been taken of modern welding techniques so as to afford the most economical process of finishing the metal joints. In addition to the huge flash welder for the balloon sections, we draw attention to the battery of massive master framing bucks set up in this department.

You will find the largest of these illustrated in the pictorial section. This one takes the front end assembly and the balloon with the floor section and completes the junction of the two. The unit is located by means of body bolts at the floor and through the hinge pins for door location. When the alignment of door and roof openings is complete, the roof rail is gas-welded to the windshield header, using a guide fixture.

When the 120 plant was being planned it was decided to start from scratch and equip it with the most modern type of high-production machinery consistent with the probable volume requirements for a car of this type. Perhaps the most noteworthy of the equipment in this category was the Ingersoll installation for cylinder block machining which was described completely in







● View of the well known Packard machine used for machining cylinder head combustion chambers. Articulated joints in the driving heads coupled with a cam-controlled pivoted table permit the development of undercut profiles.

● ● Senior engines taking form on the assembly line. About midway, where the eighth operator is working, is the special fixture used for the fitting of piston and rod assemblies. With the pistons held securely in alignment by special fixtures, the block is set in place with the aid of a Curtis air hoist.

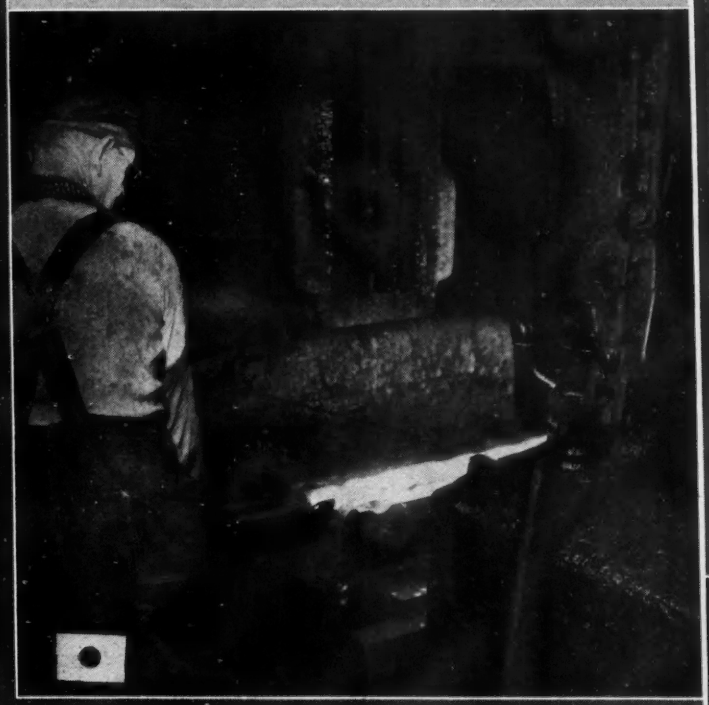
● ● ● Hypoid ring gears used on the entire Packard line are run in on this battery of Gleasons.

● ● ● ● Looking down the Senior cylinder block machine line. In the background are a Carlton radial and two Ingersoll multiple spindle drilling machines with detachable heads. In the foreground is an eight-spindle Greenlee boring machine.

● ● ● ● ● Senior crankshafts are machined all over, including the counterweights. Here is a battery of Schraner polishing machines lapping the pins.

Packard 120 Surface Broaching Details

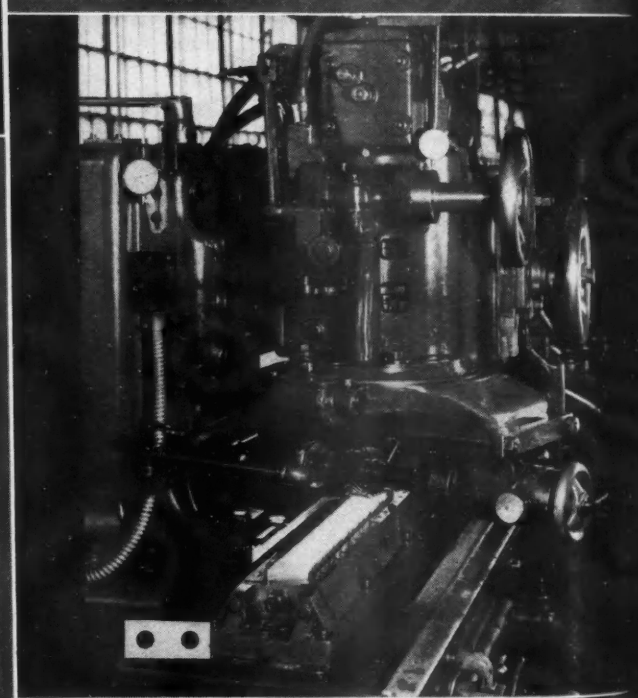
Description	Operation	Mat'l	Brinell	Equipment	Prod. Per Hr.	BROACH DATA Stroke (in)	Tool Lgth. (in)	Surface Speed (fpm)
Connecting Rod and Cap	Broach sides and nut seats	Forging	149-174	Oilgear Vertical	240	24	21	20
Steering Knuckle	Broach both sides of two bosses	Forging	229-269	American Vertical	67	57	48	19
Cylinder Block	Sides and lock joints 5 main bearings	Alloy Iron	216-255	Oilgear Horizontal	55	122	84	13



first season's production is that of special fixtures and tooling. Thus the cost of the new job, as in the case of the first run of the 120's, is not penalized by the amortization of special machinery, as is usually the case, and this feature unquestionably was a big factor in establishing the retail price of the 120 line.

Just as an illustration of the character of the equipment in this plant, we show elsewhere in this article a number of tables giving the routing and tools for the crankshaft, connecting rod machining, and connecting rod and cap assembly. We have also prepared a table giving the chief elements of three surface broaching operations which are of more than passing interest.

Although the 120 plant is little more than a year old, you will find a number of new items of equipment installed only a few months ago. One of the most interesting of these is the Tomkins-Johnson "Clinchor," an automatic high-speed machine used for spinning-in the inserts



● **Light Chambersburg hammer pounding out the 120 camshaft.**

● ● **Senior transmission gears are given "correction" treatment prior to heat treat on this Michigan Tool gear shaver.**

● ● ● **View of 120 final assembly line at point where front end sheet metal is installed. An overhead electric hoist carries the sheet metal unit to the line from the special monorail assembly at the right.**

Automotive Industries. Here is a unique line of unit-type machinery tooled to function as special purpose set-ups but sufficiently flexible to permit retooling to accommodate changes in the present design or a rearrangement of heads and fixtures for an entirely new block.

This is the first installation of its kind in the automotive industry. Apart from its advantages in the machine shop, it offers certain economic features which may well be mentioned here. The most important of these, beyond a doubt, is the fact that unit-type equipment may be amortized over a reasonably longer period of time and consequently the only burden that need be carried by the

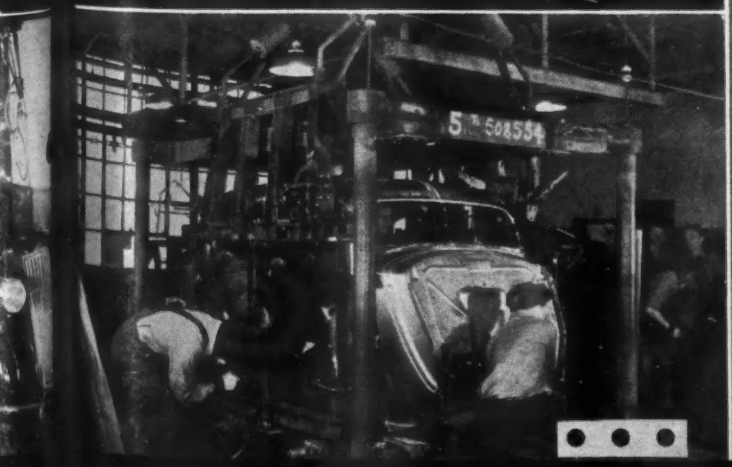
on dampener drums. Not only is this operation very fast and economical, but its introduction superseded the previous expensive practice of welding an extra disc on the drum and then tapping holes for the fastenings. Another of the new machines is the Productomatic miller, a very heavy type of milling machine used to mill simultaneously eight locating spots on the crankshaft forging.

A new type deep-hole driller for connecting rod galleries is found here. This is a six-spindle Leland-Gifford sensitive drilling machine fitted with the well-known step-by-step hydraulic feed mechanism which was developed by Leland-Gifford for crankshaft oil hole drilling. This driller uses a modified form of conventional drills; it has a very high productive rate, and guarantees a straight, accurate hole.

As will be evident from the illustrations in the pictorial section, the 120 plant is completely conveyorized to facilitate the flow of material and the handling of assembly operations.

Packard Factory Executive Personnel

G. T. Christopher	Vice-President of Manufacturing
Burr W. Fitch	Budgets Manager
R. R. Rees	Plant Engineer
R. N. Brown	Master Mechanic
E. T. Phillips	Production Manager
R. M. Williams	Chief Inspector
A. J. Reddy	Supt. of Forge Shop
F. Carpenter	Supt. of Foundry
Oscar Findling	Supt. of Main Division
Henry Winfield	Supt. of Stamping Division
J. C. Kelsey	Supt. of One Twenty Division



● "Shower Bath" removes all traces of cleaning acids on body surface. Note bodies moving through on cradles suspended from monorail.

● ● Gun welding on the 120 balloons.

● ● ● Master framing buck takes care of door and roof opening alignment before the front and rear sections are welded at the roof panel.

Packard has been noted for its contributions to machine shop practice in the development of specialized production equipment. One of the best known of these is the special multiple-spindle machine used for forming the undercut combustion chamber profile in cylinder heads, used today in the Senior engine department. Another example, this one in the 120 plant, is the special burring attachment for Barber-Colman hobbing machines. It is fully automatic and comes into action at the time when the finishing cut is completed. The illustration in the pictorial section shows the attachment at work in the production of spiral-cut transmission cluster gears.

A visit to the Senior manufacturing plant across the street affords an inter-

● View in trim shop showing building of Packard 120 seat backs. Note monorail feeder line in background.

● ● One of the endless monorail lines in main building paint shop carrying variety of small parts, lamps, fittings, etc., in matched sets.

● ● ● Body drop fixture in action on Senior final assembly line.

● ● ● ● Sheet metal is scheduled in paint shop in complete sets for an individual car to assure correct color match.

esting contrast, for the scene shifts from a high production operation featuring fast, economical techniques, to one of slower tempo more consistent with the building of fine, high-priced automobiles. Here the equipment is of the standard, universal type and the responsibility for quality falls on the skilled craftsman rather than on a specialized machine.

Senior lines produced in this factory include the Packard Eight, Super Eight, and Twelve.

Here, too, are complete machining departments for the manufacture of nearly everything that goes into the chassis, and a second complete body shop. In the Main Division, as the Senior car plant is called, several departments handle materials for all lines of cars. Here the rear axle gears for all cars are assembled, run-in and tested.

On the top floor of the long building extending along Concord Avenue, all 120 wheels are painted and striped with an ingenious mechanical device originated and developed by Packard. Fenders, splashers and the like for all cars are finished on the same floor. Wheels for the Senior cars are painted and striped on the first floor adjacent to the main assembly line.

The three engines for the Senior cars are assembled on the same line and run-in and tested in the one dynamometer department for this plant. The 120 plant has a dynamometer and engine assembly installation of its own.

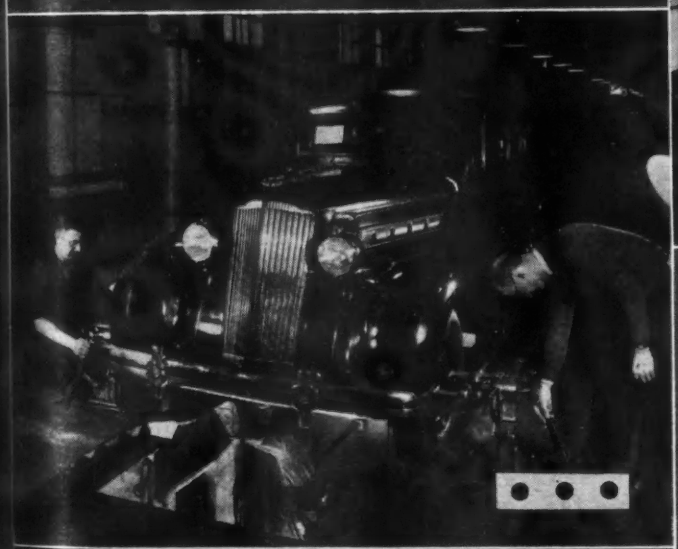
On upper floors of the Main Division

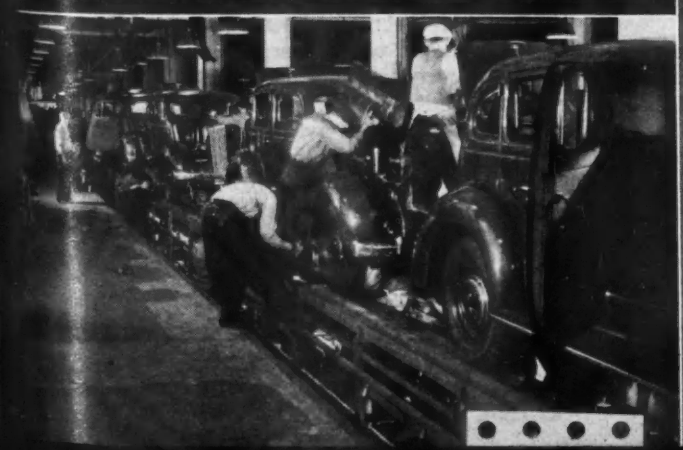
are automatic screw machines, centerless grinders, and several other departments making innumerable small parts for all cars. As in the 120 plant, there is a complete engine machining line for both the block and the head. Another complete set-up takes the crankcases of all three Senior engines. Crankshafts and camshafts are machined and balanced on the first floor of the Senior plant. Incidentally, these shafts are machined all over, including the counterweights.

Parts other than those for the engine are made in the machine shops on the upper floor, with the exception of the steering gear, the parts of which are made on the first floor, where the entire steering mechanism is also assembled.

The main assembly line extends about a quarter of a mile along the east side of the Main Division. Cars leaving the assembly line are taken directly to the "junior" proving grounds at the corner of Harper and Mt. Elliott Avenues. Here all the Senior cars are given a road test. They are driven over washboard and Belgian granite block roads, so made as to give a car sufficient testing to develop any squeaks and rattles. Motors are tuned up in this road testing.

Here, indeed, is a shining example of what may be accomplished with the right program, good planning, and modern production facilities and machinery. Certainly Packard has done well by the introduction of the now famous 120 car, as the registration figures will attest.





● **Final inspection and finishing touches on the Senior line.**

● ● **Final inspection and finishing touches on the 120 cars.**

● ● ● **Special station for wheel alignment on 120, equipped with latest type Bean tester for camber, caster, and toe-in. For this test the car is driven over the pit and pulled down into normal curb position by means of a hydraulic mechanism.**

● ● ● ● **Another view of the 120 final assembly line taken at the pit station where underbody fastenings are made. The pit is provided with storage bins for the various fastenings.**

JUST AMONG OURSELVES

Oil for the Waters Of Standardization

DURING the past week many persons in the industry have received from the chief engineer of a large oil company an open letter drawing attention to the company's disagreement with certain S.A.E. lubricants standards, and suggesting, in effect, that the standards should be ignored in favor of a simple system of making recommendations which is advocated by the company issuing the letter.

In the minds of several of the people with whom we have discussed the points in the letter there rests the view that an issue not mentioned in the "open letter" is of somewhat more fundamental importance than the things discussed. This issue revolves around the character of S.A.E. standards procedure, which sets up committees open to representation by all interested parties, and whose decisions are constantly subject to review when there is any doubt as to whether committee action fails to represent the true views of an interested majority.

Our informants believe that the present S.A.E. lubricants standards are acceptable to most motor-vehicle engineers and to a large majority of lubricants suppliers. Over a period of years the few companies which object to the S.A.E. system of lubricants specifications have had full opportunity to present their objections to S.A.E. committees representing oil refiners and motor-vehicle manufacturers. Within recent months the S.A.E. went so far as to appoint a special committee to review the pros and cons of the questions involved. This committee heard testimony respecting the lubricants specifications and decided that the latter were acceptable to nearly all the interests involved.

Under the circumstances, it seems to our informants, there is nothing to be gained by reopening the questions for "public" discussion. The rules of the game have been established to the satisfaction of the players. The real issue, many believe, is a matter of simple sportsmanship rather than of technical validity.

Unions Backfire On Big Steel

OF timely interest, in view of the United Automobile Workers Convention in South Bend this week, and of our last week's article forecasting the concern of industrial unionism with the motor vehicle industry, is an article in the May issue of *Fortune* analyzing the results of the U. S. Steel Corporation's policy on labor relations.

The steel corporation is the largest single employer of labor in the country. It has encouraged the formation of "company" unions. In the late summer and fall of 1935, the article records, these unions were breaking away from the company's dominance "like ice jams breaking up in the spring."

The article furnishes instructive reading for automotive executives, pointing out as it does, that with steel company unions breaking through from the inside out, they will probably be ripe for organization-affiliation with the John L. Lewis faction of organized labor. And whichever way Big Steel swings, with respect to its attitude on labor, the swing will have a profound effect on labor questions in the steel industry and in all mass-production industries dependent upon it in any way.

One of the most interesting conclusions of the *Fortune* article is that welfare work and paternalism as practiced by U. S. Steel have improved the health but depressed the morale of the workers. The conclusion is that such policies may not be to the best interests of a corporation, particularly when they are accompanied by a self-satisfied and self-righteous feeling that everything possible has been done for the welfare of workers.

The basic question, the article asks, is whether the worker prefers to live on the bounty of a corporation, or to seek through the strength and protection of a union to live with less dependence on the decisions of corporation executives.

Tax Trend Nibbles At Diesel Fuels

A BILL recently introduced by Mr. O'Connor in the House of Representatives (H.R. 12,167) would impose a tax of 1 cent per gallon on fuel oil sold for the generation of heat or power, but specifically exempts such oil when used in internal-combustion engines.

Another bill introduced by Mr. Boland (H.R. 12,161), would place an import tax on both fuel oil and gasoline, unless imported for refining purposes.

There seems to be no question of a trend to tax fuel oil as its use increases, and as the States and Federal Government become conscious of its availability as a tax source. All economic estimates of the future of fuel-oil engines will have to consider this fact as of increasing importance.

—H. H.

Aluminum for Plymouth Pistons

is melted in small, oil-fired furnaces to eliminate one operation.

A PAPER dealing with the manufacture of aluminum pistons with elliptical skirts was presented at the recent S.A.E. production meeting in Detroit by E. S. Chapman, general works manager, Plymouth Motor Corp.

The following analysis is used in making the Plymouth piston castings:

Copper	6.25 to 7.75%
Iron	1.5% Maximum
Magnesium	.25 to .3%
Silicon	5 to 6%
Zinc	.5% Maximum

The material is received in ingots of 32½ lb. which are melted in small, open-hearth, oil-fired furnaces having an exposed discharge well at one end. Two molders dip from one furnace. This type of unit has replaced the rotary tilting type which required the use of a bull ladle which distributed the molten metal to holding pots at each pair of machines, thereby eliminating one handling of the metal and avoiding a great deal of excess heat in the department. Permanent molds and permanent collapsing cores are employed—the molds being filled by gravity only, no pressure injection being used. The molds are heated by a gas flame before production is started, after a shut-down, to minimize imperfect castings. Molds are split on the vertical center line of the piston and open and close horizontally; the three-piece cores being withdrawn vertically. The casting is poured with the head up and a sprue of generous size is desirable to provide for the considerable shrinking of this material. One operator tends two molding machines which are hydraulically operated. and the average output is about 70 castings per hour per man.

When a casting has cooled sufficiently to be removed from the mold, it is conveyed to the heat treating, or annealing furnace. The heat treatment is very important, as any variation not only affects the strength and hardness, but also the important factor called secondary growth, which must be held as constant as possible.

Due to the light weight of the work being handled, an overhead oven has been found practical and conserves a great deal of space. The heat treating cycle is of course controlled by the speed of the conveyor, which normally provides for 6 hours in a heat of 400° F. for the analysis of material being considered here.

This type of piston is designed to fit the cylinder bore with a very small clearance, averaging about .001 in a cold motor, the expansion under operating temperatures being compensated in the slotted skirt. Quiet operation, especially with cold engines, demands extremely close fits and therefore narrow machining tolerances for all bearing dimensions.

The skirt of the piston is oval, the shape being that of an ellipse whose minor axis is .011 less than its major axis, the major axis being at right angles with the wrist pin. The skirt is also tapered, the mean diameter at the open end of the skirt being .0005 greater than immediately under the lower ring grooves. Four rings grooves are provided, the two top grooves being fitted with compression rings, while the two lower grooves are fitted with oil rings. Ten ⅛-in. oil holes are drilled in the No. 3 ring groove, while four ⅛-in. oil holes are drilled in No. 4 ring groove. These holes are provided to allow the oil collected by the oil rings to return through the holes to the oil pan, thereby preventing oil pumping. There are also two ⅛-in. holes drilled in the No. 4 ring groove. These holes are approximately 120° apart and the 3/32-in. horizontal slot previously mentioned terminates in them. Two 7/32 holes are also drilled at each end of the vertical slot.

Machining methods naturally will vary somewhat between motor plants set up for moderate volume and the large volume plants. These set-ups vary mainly in whether or not the piston will be turned and grooved in one or two operations; slots milled in one or two operations; the elliptical contour ground on external grinding machines with a cam attachment, or on centerless grinding machines; or diamond turned on special equipment; the piston pin holes finish reamed or diamond bored; and whether engineering specifications demand a common weight piston for service in the field, and an anodic plating process for long life.

In one plant the operations are as follows:

Operation No. 1 — Bore, face and chamfer open end, on an 11-in. engine lathe, equipped with a special 2-jaw air-operated chuck.

Operation No. 2 — Drill, ream and chamfer piston pin holes and cut lock ring grooves.

Operation No. 3—Rough and finish turn outside diameter; rough and finish form and chamfer ring grooves; rough and finish face head end.

The skirt of the piston is not cam turned although such a turning attachment could be installed. .010 stock is left on the outside diameter for grinding.

The ring grooving tools are held in magazines which have previously been set up to expedite tool changes. All tools on this operation are tipped with tungsten carbide. Coolant is used. This machine produces 180 pieces per hour.

Operation No. 4—Drill (10) ⅛ holes in No. 3 ring groove.

This operation is performed in a special horizontal drilling machine equipped with (10) motor driven spindles mounted on a common base and spaced at the proper angles.

Operation No. 5—Drill (5) ⅛ holes in No. 4 ring groove and (4) 7/32 slot holes.

Operation No. 6—Drill (4) 5/32 holes through piston pin bosses.

Operation No. 7—Saw horizontal and vertical slots.

Operation No. 8—Rough cam grind outside diameter.

This operation is performed on a centerless grinder and the method is rather unique. The regulating wheel has been replaced with a nitrided six lobe cam having between its high and low point the desired difference to give the right elliptical shape to the piston.

Operation No. 9—Finish cam grind outside diameter.

This set-up is a duplicate of the method used for rough grinding. .005 stock is removed in this operation. The piston is ground with a .0005 taper, the greatest diameter being at the open end. The operators check their work with amplifying gauges.

Operation No. 10—Rough and finish diamond bore piston pin holes.

This operation is performed on a four-spindle diamond boring machine having (2) roughing spindles mounted on one end and (2) finishing spindles mounted on the opposite end. Two pistons at a time are bored. Tungsten carbide tools are used for roughing and diamond tools for finishing—.010 stock is removed by the finishing tool and a limit of .0002 in diameter is held. Coolant is used on this operation. The production per machine is 150 pieces per hour, one operator running two machines.

Operation No. 11 — Weigh and machine to common weight.

This machine consists of a cam feed drilling unit mounted vertically on a base and set in relation to a weighing scale with a special platen mounted directly above. A limit of plus or minus two grams is held. A production of 200 pistons per hour is obtained.

Operation No. 12—Inspect ring grooves and piston pin hole.

An electrolimit gauge is used on the piston pin hole, which checks the size to four ten-thousandths the allowable limit on the hole.

Operation No. 13—Anodize.

Racks of pistons are loaded on a conveyor chain which moves through a series of tanks for the following operations:

Dip in cleaning tank whose solution is heated to 160°-180° F.

Cold water rinse.

Dip in anodizing tank of 25 per cent sulphuric acid solution at 72° F.

Cold water rinse.

Hot water rinse.

One notable feature of this process is that as the coating is formed, the resistance to electrical current increases. The current consumption is 20 amperes per piston (average) and current density is 14 volts. In anodizing the piston increases its growth uniformly about three-tenths of a thousandth.

Operation No. 14 — Inspect O. D., grade for size and stamp trade mark and size.

All pistons are inspected for diameter after anodic plating. This is made necessary by the growth of the piston in the plating process. The growth averages .0003. It appears to be constant both on the diameter and in the ring grooves and piston pin holes.

The pistons are inspected at a temperature of 70° F. with electro-limit gauges. Four grade sizes are allowed and designated A-B-C-D with a variation of .0005 between grades.

Alloy Plating Bath and Process

METALLURGISTS and production executives in the automotive field, particularly those concerned with chromium plating, will be interested in the complete details of a new bright nickel alloy plating bath and process which is announced by The Hanson-Van Winkle-Munning Co., Matawan, N. J., This process was developed by Weisberg & Greenwald, Inc., N. Y., and is covered by U. S. Patent No. 2026718, issued Jan. 7, 1936.

Following are the principal advantages claimed for the deposits produced by this process:

1. Mirror-like lustre.
2. Bluish-white color.
3. Ductile deposit.
4. High current rates of deposit.
5. Non-pitting.
6. Brightening agents and all components of the solution readily analyzable assuring continuity of production and reduction of rejects to a minimum.
7. Can be plated directly on steel.

Thin deposits produced from this solution are said to have a mirror-like brightness when applied to a bright, well polished surface such as steel or brass. It is also claimed that the brightness of the plate will increase with the thickness of the deposit. This sometimes results, it is claimed, in covering up minor imperfections in the base metal to a considerable extent. Even when the underlying metal has a surface which is not smooth or well polished, it becomes more and more lustrous as the plating proceeds and the final appearance is improved if sufficient thickness of deposit is applied.

An interesting feature of this bright nickel solution is the fact that it contains some cobalt. This is obtained by the use of special cobalt-nickel anodes. The effect of the cobalt in the deposit is to produce a color which does not have the yellowish tinge of straight nickel and is less blue than chromium. The result is a bluish-white deposit, which takes a beautiful chromium covering.

A strong feature claimed for the deposits of the bright nickel solution is ductility. They are said to compare favorably in this respect with the best dull nickel deposits of similar thickness and, in fact, can be used to plate sheets which are stamped and formed subsequent to plating. These deposits are said to withstand bending and other mechanical operations.

Bright nickel plate can be deposited at current densities of from 40 to 60 amperes per square foot on a commercial scale. There is however, considerable leeway in the bright plating range both above and below these limits. With the possibility of depositing a plate at such high current densities work can be processed at a faster rate thereby making it advantageous where large scale production occurs or where plating space is limited.

Bright plate of heavy thickness can be obtained without treeing or burning. A burn in this solution, caused by excessively high current densities, takes the form of a cloudy deposit which can usually be covered over by continuing the plating for a short time at the proper current density.

Bright nickel plate is not produced simply by the addition of cobalt to the deposit. The brightening agents employed in the solution are definite chemicals which are commonly available in pure form and the amount of which in solution can be determined by simple and rapid methods of analysis. This eliminates guesswork and rule-of-the-thumb methods and in turn, assures continuous and uninterrupted production and reduces rejects to a minimum.

An interesting use of this process is being made in plating zinc die castings. After buffing the castings they are plated with 0.0003 in. of copper and then bright nickel. The nickel is followed by chromium. With a little attention to keeping the copper smooth and fine grained, no buffing is necessary after the copper or nickel.

The Horizons of Business

By Joseph Stagg Lawrence

The Business Outlook

THE current business situation and the outlook has the statisticians and economists of the financial district by the ears. The picture is highly confused, with each side in a position to offer strong evidence that things are getting rapidly worse or rapidly better as the brief may hold.

Those who believe that the improvement in business and security prices started with the death sentence of the NRA last May point to a number of immediate, disturbing factors. First, there are the French elections upon which it is said hinges the monetary future, not only of France, but of the entire gold bloc. It is feared that a victory by the French Left will result in an abandonment of gold by France and that the other gold bloc nations, Switzerland and Holland, will be forced to follow suit. This, so the argument runs, will have an extremely deflationary effect in this country. The estimates vary but it seems that a great many people believe that the French have at least $200 million in American securities which they will be prepared to dump on the market in the event devaluation occurs. The technical condition of the American market is so bad, aver these commentators, that such a sale of securities will precipitate a far-reaching reaction.

Security Profits

From this point they advance to the next, namely, that a substantial part of the recovery in buying power experienced during the past twelve months has been the result of appreciation in security prices. In the stocks listed on the New York Stock Exchange such appreciation totals $22 billion, roughly equal to 40 per cent of the national income for 1935. The collapse of the market would wipe out a substantial portion of this capital windfall, make millions of consumers feel poor and force business to retrace a part of the splendid gains made during the past year. This doleful picture is garnished with emphatic references to the exaggerated estimates of earnings for business during 1936. It is this over-discounting of future profits, plus a mistaken confidence in the permanence and stability of business recovery, which accounts for the rise in security values. Such is the case presented by the pessimists.

Farm Income

On the other side we have equally convincing testimony that 1936 will be the best year of recovery to date. We may start out with the American farmer. His cash income during the first two months of the year is 20.6 per cent ahead of the corresponding months in 1935. This comparison excludes rental and benefit payments. In 1935 these amounted to $122 million for the first two months and in the corresponding period of 1936 to $1 million. After we allow for these sums, 1936 is still 5.6 per cent ahead of last year. In other words the American farmer has made such decided strides that he is able in the early part of 1936 to show a more satisfactory income position without government assistance than he was able to show with $122 million of such aid in 1935.

Sources of Farm Prosperity

It would seem quite clear, entirely aside from the main issue, that farm prosperity is not dependent upon the AAA. The farm outlook for the rest of the year is exceedingly bright. Planting intentions for the coming year show an estimated acreage of 299,000,000 as compared with 281,000,000 in 1935 and an average of 296,000,000 in the five-year period 1928-1932. Most of the increase over last year is in spring wheat and peanuts, neither of which constitute important sources of farm income.

There are two factors of major importance influencing the farmer's position during the remainder of the year. Under the Soil Conservation Act the government plans to distribute between $500 million and $600 million to the farmer. The government likewise feels that it is under moral obligations, to farmers who signed AAA contracts, to pay out an additional $200 million. Thus we see from $700 million to $800 million as the amount which will be distributed to farmers during the balance of the year. It is not unduly cynical to predict that these distributions will mount and perhaps reach their highest point in October.

Another factor of importance to the farmer is the release of the consumer from AAA taxes as well as substitutes for those taxes. In the face of rising payrolls and improved national buying power, it is reasonable to look for growing strength in the position of the farmer. This is important, not only to mail order houses and implement manufacturers, but also to the automobile industry.

Residential Construction

In spite of a discouraging winter, construction is making gratifying progress. Residential construction contracts during the first quarter show a gain of 75 per cent over the same period in 1935. This compares with an improvement of 25 per cent which the first quarter of 1935 showed over the same period of 1934. Residential construction is still less than 20 per cent of the average for the period 1924-1929. Even after making ample allowances for the greater buying power of the building dollar, the fact remains that construction has far to go before the danger of excess becomes real. Non-residential construction for the first quarter is 118 per cent ahead of last year and public works and utilities 60 per cent.

The business dispatches that come from the automobile, steel, rail and power fronts all suggest a strongly upward surge of business. It should be noted in considering the movement of business at this time that the advance is general on all fronts. This is in sharp contrast to the bulge that took place in the summer of 1933 when an exaggerated and artificial move in the textile industry was largely responsible for raising the business average. It seems to this commentator that the controlling force in the larger question relating to the future of business is the course of the fundamentals, namely, production and income. On these two criteria the outlook for the balance of the year is highly encouraging.

(*Turn to page 648, please*)

Automatic Mixture

IN a paper presented at the recent S.A.E. National Tractor Meeting in Milwaukee, R. W. Young, chief engineer of the Wright Aeronautical Corporation, described a new automatic mixture control developed by the engineers of the Wright organization in collaboration with the Stromberg Carburetor Division of Bendix Aviation Corporation. A diagrammatic sketch of the mixture-control apparatus is shown in Fig. 1, and of the carburetor installation in Fig. 2.

The Bendix-Stromberg carburetor is provided with four venturi with main discharge nozzles receiving fuel through four main metering jets, which communicate with two float chambers having a common vent system. An economizer valve located in one of the float chambers is interconnected with the throttle and provides an excess fuel flow for the "upper power range" to the two adjacent venturi. Mixture control for altitude compensation or fuel economy is achieved by "back suction" on the float chamber.

Referring to the drawings, a control unit, consisting of a sylphon and a spring-loaded plunger valve flattened on one face, is contained in a duralumin housing fastened to the upper body of the carburetor and located centrally with respect to the carburetor venturi (Fig. 2). The sylphon is partly filled with air and partly with a fluid whose function is to dampen vibration and provide temperature compensation. Movement of the sylphon controls the travel of the plunger valve against spring-loading and thus regulates the suction between passages A, D, E and disc valve F. Passage E, shown as exterior to the carburetor body for the sake of clarity, is actually in the upper half of the body. The plunger valve, by a suitable contour and flattened surface at its lower end, and through the disc valve at F regulates the suction created in float chamber H, so as to give a constant fuel-air ratio as the air density at A varies. Space A communicates through slots surrounding the venturi with the air horn, the density in which varies with the altitude and temperature. Thus as the air-intake density decreases with an increase in altitude or temperature, the sylphon increases in length. This lowers the plunger valve and further reduces the area of the restricting passage between D and E which connects float chamber H with space A behind the venturi. This increases the float-chamber depression created by the suction nozzle through C. Therefore, the effective metering head causing fuel to flow from the main discharge nozzles is decreased and the mixture strength is reduced.

The restriction in the suction-nozzle passage prevents the depression in the float-chamber from ever equalling that at the main discharge nozzle, so there is always an effective metering head for fuel flow under all conditions of flight. The economizer nozzle has been replaced with a quick-action climb valve, connected through a cam action to the mixture control. Except in the

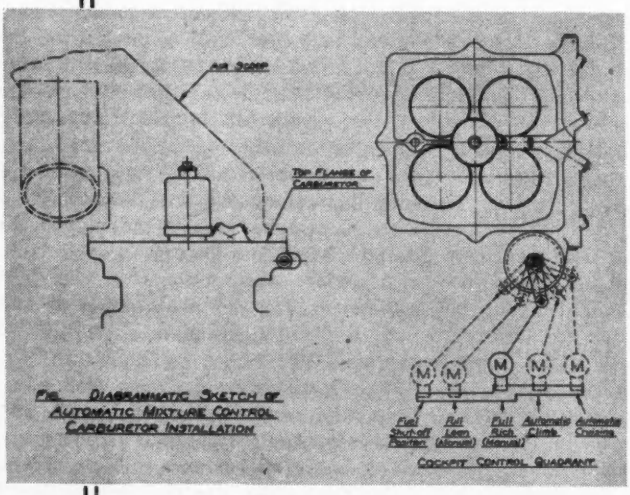


Fig. 1—Diagram of automatic mixture-control system for Bendix-Stromberg aircraft carburetor

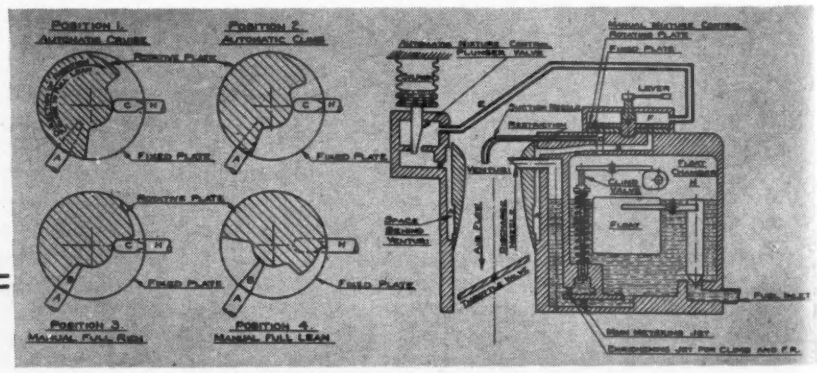


Fig. 2—Installation diagram of carburetor with automatic mixture control

Control

A Sylphon tube controls the mixture furnished to Wright Cyclone engines by the Bendix-Stromberg Carburetor.

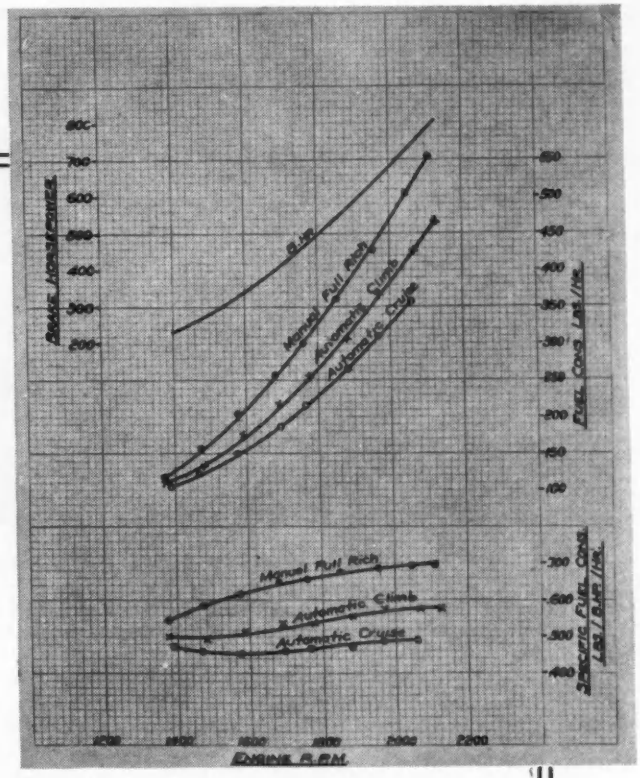


Fig. 3—Flight propellor - load fuel flow and specific fuel consumption curves of Stromberg carburetor with automatic mixture control on Wright Cyclone model with 92 - octane fuel (Compression ratio, 6.4; supercharger ratio, 7.14)

"economical - cruising" position this valve is open and assures a pre-determined increase in mixture strength. When the control is set for "automatic cruise" this valve is closed and there is no flow of additional fuel through the richening jet shown at the bottom in Fig. 1.

Fig. 2 is an installation sketch of the automatic-mixture-control carburetor. It will be seen that the Sylphon occupies little space and is located centrally with relation to the venturi and air scoop. A shield not shown in the illustrations eliminates temperature irregularities due to stratification of hot and cold air within the air scoop. In over a year's experience with the unit, no failure of the sylphon has occurred, but in the event of such a failure the carburetor continues to function as a conventional one, automatically returning to the "full rich" position.

The control arrangement for both carburetor and cockpit quadrant is shown in the right-hand view of Fig. 2. The lever actuating the disc control valve has five positions, corresponding to the position of the cockpit mixture control lever in the lower part of Fig. 2. With the cockpit control in the "automatic-cruise" position, the disc control-valve lever is against the stop at the end of its counter - clockwise travel. Moving the cockpit mixture - control lever to the "automatic-climb" position rotates the disc control valve 15 deg. in a clockwise direction, where it is engaged by a ball latch. For the "full-rich" position of the cockpit mixture-control lever, the disc control valve moves another 15 deg. in a clockwise direction and is engaged by a ball latch. At this point the cockpit mixture-control lever is up against a stop.

To bring the manual leaning adjustment of the mixture-control into use, the pilot must shift the cockpit mixture-control lever beyond the stop and over into the manual adjustment range, where the leaning effect is the same as with the conventional three-slot mixture control. Beyond the full-lean position of the controls, a shut-off valve may be normally engaged, which cuts off the flow of fuel to the jets and enables the engine to be stopped very quickly without running the float-chamber dry or operating the engine on an increasingly lean mixture during the usual stopping procedure by shutting off the supply of fuel from the line.

Returning to Fig. 1, on the left-hand side the rotative and stationary plates of the disc valve are shown in four different relative positions. These regulate the mixture strength to conform with the settings of the mixture-control for operating in flight. Beginning with Position 1 for "automatic cruise," the rotative plate is so disposed that float-chamber H, already connected to the suction nozzle via passage C, is in communication with air space A behind the venturi only through passages F and E, through the Sylphon-controlled plunger valve, and passage D. The depression in float-chamber H is thus maintained to give a constant head on the main discharge nozzles. In this position of the automatic mixture control the climb valve is closed.

In position 2, for automatic climb, the rotative disc is moved clockwise 15 deg., but the passages are in the same relative position as for "automatic cruise." However, to enrich the mixture for climbing, a cam arrangement on the mixture control opens the "climb valve" and permits additional fuel to flow to the main discharge nozzles.

In position 3, for "manual full rich," the rotative plate is moved 15 deg. farther in the clockwise direction, whereby float-chamber H is connected to the suction nozzle and to space A behind the venturi via passages B, F and C without communicating through the Sylphon-control valve. Under these conditions the depression in the float-chamber is a minimum and the flow from the main discharge nozzles is at the maximum. Thus the manual "full

(Turn to page 648, please)

PRODUCTION LINES

Putting the final touches on the G.M.C. truck rear ends on this line. At the end of the line, in the background, the axles are hoisted to the second floor to final chassis assembly.

Cost vs. Economy

Some of the boys at the machining session of the production meeting gave the c-t-c experts a few anxious moments when they brought up the matter of the extremely high price of cemented-carbide tools. We do not believe we were wrong in rising to remark that it is fallacious to talk about prime cost of a tool without regard to the work it accomplishes and the economies it effects. After all what counts is not how much you pay for the tool as—what do you get in return. If it reduces time, if it cuts down regrinds, if it boosts production, in short if it does the work economically it will justify any reasonable price.

Small Tools

Incidentally, the production meeting brought out the fact that applications of the cemented-carbide grades are growing by leaps and bounds and the end is nowhere in sight. By the same token there is ample evidence that a great many jobs may be handled more economically by J-metal and it is to the credit of the tool engineers that they know just where to use the one or the other.

With Movies

One of the most interesting of the technical papers presented at the recent S.A.E. production meeting was R. N. Brown's on the Ingersoll cylinder block line which was developed for the Packard 120. Apart from the fine presentation, for which the author is to be complimented, we were most interested in the use of motion pictures to illustrate the function of each machine. It was the nearest thing to a lecture at the working machine that we have ever witnessed.

Demand Technique

Have you ever tried turning your knotty production problems into demands? The technique is to turn the problem around and say to yourself, "I want something that will in some way overcome so-and-so." Then take a sheet of paper and write down exactly what the "so-and-so" is that you want overcome, without bothering your head about what or how the "something" may be that will "someway" overcome it. Show the paper to everybody around you until someone takes hold of it. . . . Men like to work to a challenge. . . . First thing you know, someone will lay the solution on your desk.—Editorial in *Aluminum News Letter*.

Check Economy

R. E. W. Harrison brought up a very fundamental point in his discussion of cast cam and crankshafts at the S.A.E. production meeting. He drew attention to the fact that the balance sheet for production economy took into account the great amount of material which is machined from drop forged shafts. Is it not conceivable, he asked, that if modern forging machinery were used it would be possible to produce forgings more true to final dimensions and with much less metal for removal in the machine shop? There is no better answer, to our mind, than the present practice at Buick. They modernized the forge shop and then introduced the mass balancing machine which produces centers in the rough forging about an axis running within a good tolerance of the correct center of mass. Buick finds that metal removal has been cut from 60 to 70 per cent. Think that over!

Eye Appeal

Ray Perry tells us that Ingersoll has supplied a number of the biggest open side planer type machines ever used in this industry to some of the die shops. The outstanding feature of these machines, quite apart from their utility, is that they have been designed from the viewpoint of eye appeal—they are really good looking and liven up the shop.

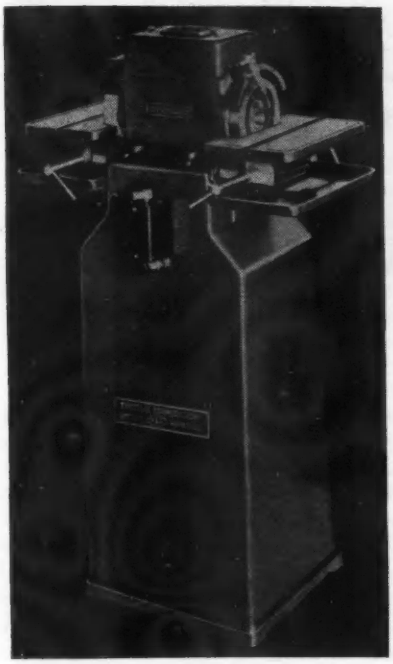
Special Gearing

There seems to be a revival of interest in worm drives for passenger cars. According to private advice, a number of car makers, whose experimental work is along the lines of rear engines and front drives, are testing worm gear sets of a special "cone" contact type. Among the important features of this gearing are self-lubricating quality and greatly increased load capacity.

Takes Juice

Aluminum would still be a rare metal if electricity could not be produced at a low cost, for from 10 to 12 kilowatt hours are required to make each pound of the light metal.—J. G.

MANUFACTURING MANAGEMENT METALLURGY



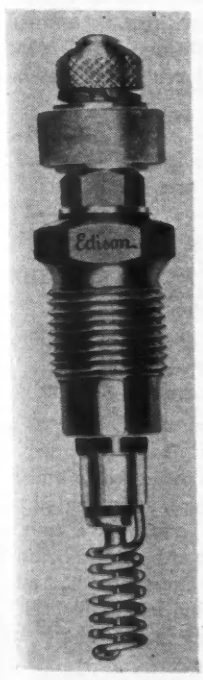
Ex-Cell-O grinder uses 6-in. wheels

Ex-Cell-O Has New Carbide Tool Grinder

The No. 46 Ex-Cell-O carbide tool grinder is designed for the grinding and lapping of single point cemented carbide tipped turning, facing and boring tools. The machine uses diamond wheels, silicon carbide vitrified cup wheels or diamond lapping disks. An adjustable tool support table with a hardened and ground surface is located at each end of the machine with a two-inch adjustment to take care of wheel wear and also to obtain the correct rake and angle on the tools to be sharpened. The 1/3-hp. electric motor is mounted in the base of the machine and drives the grinding wheels through a V-belt. A drum type switch is mounted on the front of the machine for starting, stopping and reversing the direction of rotation of the motor for grinding right- and left-hand tools. This grinder is built by the Ex-Cell-O Aircraft & Tool Corp., Detroit.

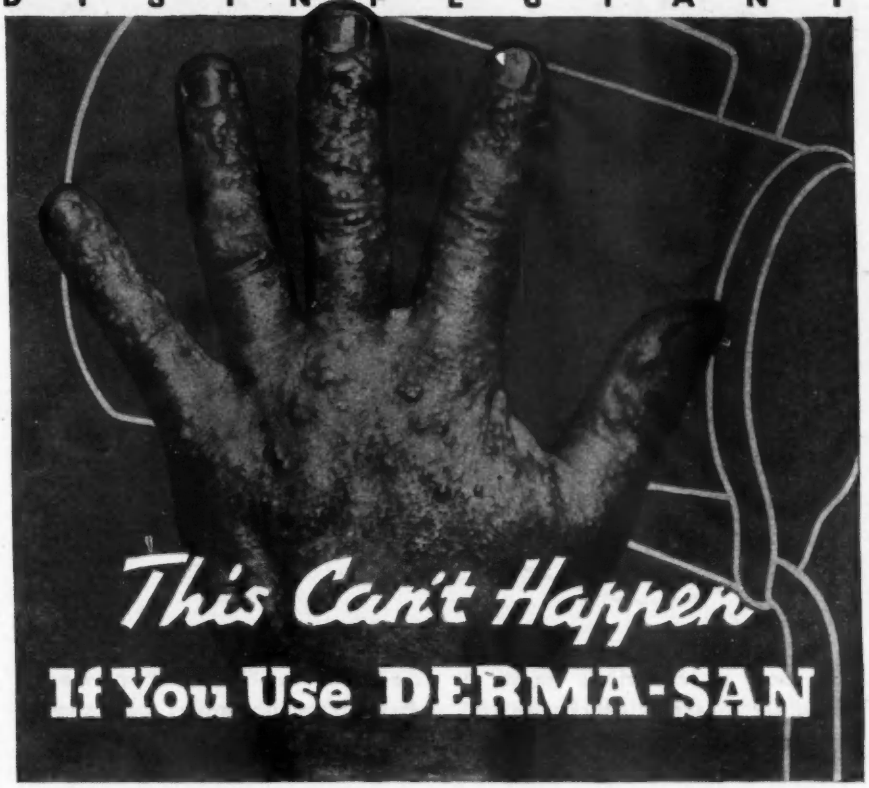
Edison Glow Plugs Used On Comet Diesel Engines

To aid cold starting all Waukesha Comet Diesel engines are now equipped with the Edison glow plug, a product of The Edison-Splitdorf Corp. These plugs, which are of the double electrode type, are wired in series to a 24-volt battery with a resistance indicator and switch in the circuit. Current is allowed to flow for 15 to 30 seconds before starting, and this heats the coils of the plugs to approximately 2000



Edison glow plug

DERMA-SAN
DISINFECTANT



OIL DERMATITIS costs plant owners millions of dollars each year. A single germ of this serious skin disease—carried from worker to worker by infected cutting lubricants—can put your entire force under doctor's care . . . cripple production . . . cause compensation payments. Protect your men from oil infections by using Derma-San. Pour one pint of Derma-San into 35 gallons of cutting lubricant and keep Oil Dermatitis out of your plant.

Derma-San is ideal for all general plant sanitation

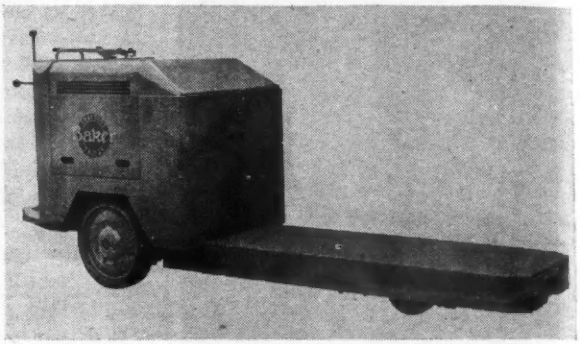
The HUNTINGTON LABORATORIES Inc.
DENVER HUNTINGTON, INDIANA TORONTO

deg. Fahr., insuring rapid ignition when the fuel oil is injected.

The Edison plugs are mica insulated and are so constructed that if the resistance coils burn out they can easily be replaced.

Baker Introduces Two New Lift Trucks

The Baker-Raulang Co., Cleveland, has just announced two new series of "streamlined" elevating platform trucks of 4000- and 6000-lb. capacity,



Baker truck with vertical lift

respectively. A feature of these trucks is the vertical lift of the platform, said to be particularly valuable in foundry work, as setting down core racks with a truck with inclined lift sometimes topples them over due to the fact that the legs of the rack strike the floor at an angle. A vertical lift truck is also said to give the operator much better control when placing the skids in close quarters or against walls. The standard platform on either size truck is 26¼ in. wide by 11 in. high by 55 in. long, although platforms can be furnished up to 84 in. if desired.

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Physical Properties Of Isoprene

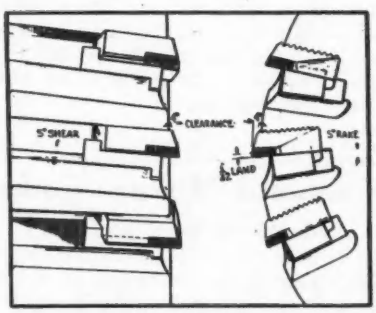
SOME experimental work on isoprene, the basic material of india rubber, has been carried out at the National Bureau of Standards. Pure isoprene was prepared for the purpose of measuring its entropy and free energy, thereby determining its thermodynamic relation to rubber. The isoprene was made by cracking dipentene and was purified by three successive distillations through a 40-bulb fractionating column. A fraction boiling within a range of 0.01 deg. C. was obtained. This fraction was found to have the following properties:

Boiling point (°C)	34.076
Change of boiling point with pressure (°C per mm.)	0.0383
Freezing point (°C)	about —146
Density at 20° C. (g per ml)	0.6805
Refractive index, $n\frac{20}{D}$	1.42160
Change of refractive index with temperature (per °C)	0.00066
Molecular refraction (from Lorenz-Lorentz formula)	25.39

When the isoprene was stored at a temperature of about 8 deg. C. over a period of days it was observed to undergo a progressive change, as indicated by increases in density, refractive index, boiling point, difference between boiling and condensation temperatures, and rate of change of boiling point with pressure. This change is thought to be due to polymerization.

Ingersoll Cemented Carbide Cutters

The Ingersoll zee-lock cutter blade is tipped with cemented carbide and inserted into a forged and case-hardened alloy steel-cutter body, which is relieved in front of the blade, both on the diameter and face, insuring adequate chip clearance. The cutting

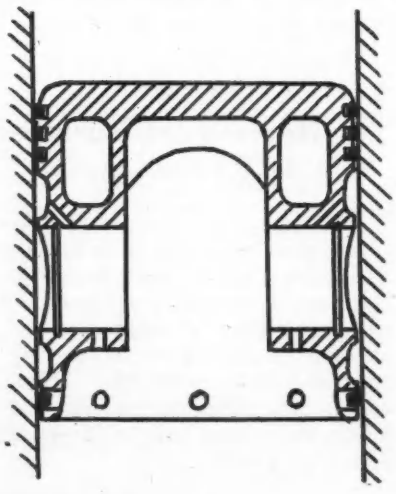


Cemented carbide cutter for cast iron

angles shown in the line drawing are those used for cast iron and similar material. The zee-shaped wedge securely retains the serrated cutter blade in the housing, it being impossible for the blade to shift while cutting, according to the maker, The Ingersoll Milling Machine Co., Rockford, Ill.

Cross Linerless Light-Alloy Cylinder

Aluminum cylinders are used without liners in engines designed and built by R. C. Cross of Odd Down, Bath, England. The pistons used in these engines are also of aluminum alloy and the only difference between them and conventional aluminum pistons is that the radial depth of the ring groove is actually less than the radial thickness of the rings. Piston rings are also conventional in form but they are made of an extra hard cast iron which wears well with aluminum, and they are made to a very accurate radial thickness. The rings act not only as sealing members in the conventional way, but also as spacers between cylinder wall and piston. Since both cylinder barrel and piston are made of the same material, only a very small working clearance is required, and this clearance, of course, occurs between the piston rings and the bottom of the ring grooves.

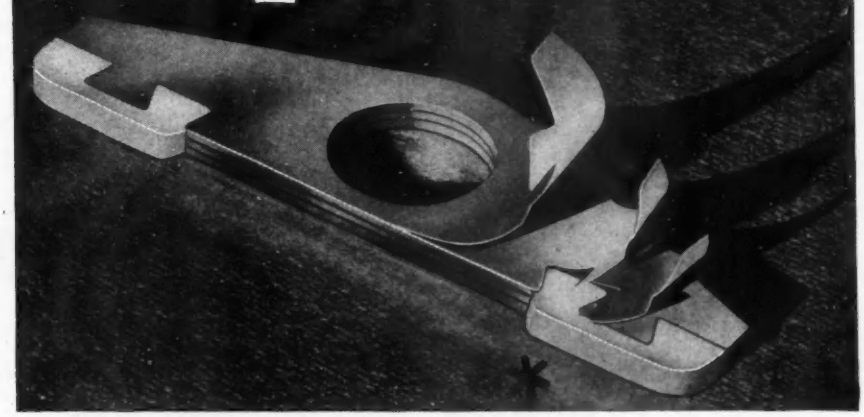


One advantage of the aluminum cylinder is claimed to be that, owing to its superior heat conductivity, a higher compression ratio can be used without fear of detonation. The chief advantage, however, would seem to be the possible weight saving. Owing to improvements in aluminum alloys in recent years, it is said to be now possible to use the same sections as with cast iron, and this would result in a weight reduction of 60-65 per cent of the block. With L-head engines, valve seats of aluminum bronze or cast iron must be used.

It is claimed that wear of the cylinder bore is much less than with the conventional cast iron blocks or liners and is practically negligible. While the wear of the rings is greater than that of the bore, rings, as a rule, need to be replaced only once during the life of the engine.

It is claimed that the cost of the finished aluminum block is about the same

Correcting and holding
bearing
oil pressure



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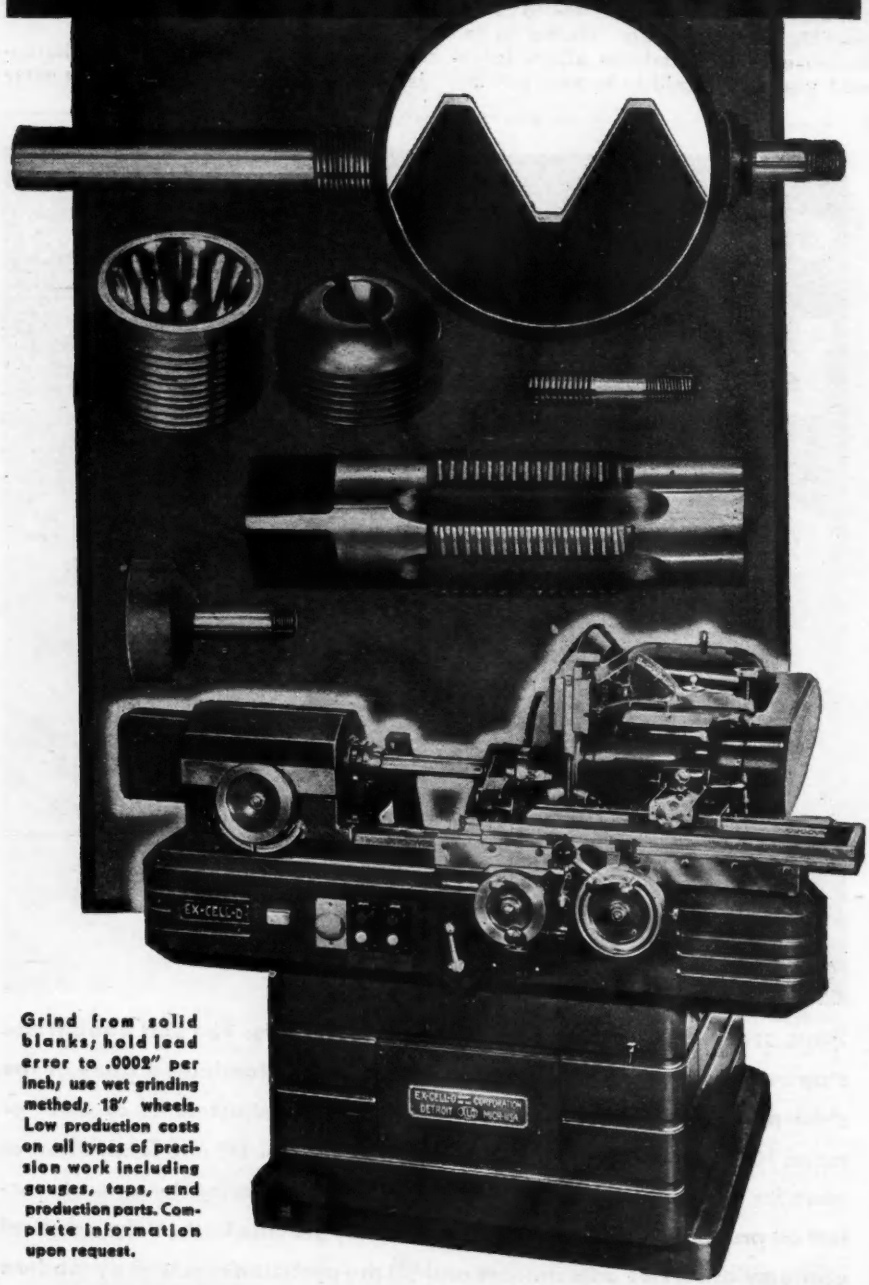

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as that of a nickel iron block because the machining of the aluminum block is less expensive, due to the free-cutting qualities of the material. Numerous different aluminum alloys have been tried for the purpose, but the Y alloy, widely used for pistons in England, has been found very satisfactory. Alloys containing a large proportion of silicon, although they can be made to work well, require a longer wearing-in period.

Aluminum alloy cylinder castings have been used without liners before, particularly in sleeve-valve engines, and the original feature of the Cross design appears to be that the piston rides on the rings.

Automatic Mixture Control

(Continued from page 643)

rich" setting is independent of the sylphon and its plunger valve.

In position 4, for "manual full lean," the rotative plate completely blocks off passage C from communication with space A behind the venturi. The suction nozzle exerts its full effect, as controlled by its restriction jet and unimpeded by leakage from A and B, on the float-chamber, so that the maximum depression at H results in a minimum fuel flow at the main discharge nozzle. For "partially lean" positions of the mixture-control lever the passage C is partly covered by the rotative plate.

For the fifth or "fuel shut-off" position of the mixture-control lever (not illustrated) the rotative plate is moved 10 deg. beyond the manual "full lean" position against a stop. The float-chamber is then subjected to the suction below the throttle, which when the throttle is closed is sufficiently high to stop the flow of fuel completely in a few seconds. Since the float-chamber is not emptied, this also facilitates restarting of the engine.

A characteristic test-stand check of this carburetor is plotted in Fig. 3. The upper curve represents propeller load horse power for flight conditions at sea level with the Cyclone engine operating on the low gear ratio of the supercharger drive.

The Horizons of Business

(Continued from page 641)

Just one cloud obscures the clarity of this gratifying view. The President's "Jefferson Day Speech" on Saturday breathed a spirit of militant reform which threatens a resumption of the economic crusading responsible for the 1934 stalemate in business. How effective this threat to business may be during the coming year, it is impossible at this time to say.